THE IRON AGE

New York, July 3, 1930

ESTABLISHED 1855

VOL. 126, No. 1

Metal Pellets, Produced by Spark Tests, Used to Identify Alloy Steels

BY WALTER G. HILDORF AND C. H. McCOLLAM*

PELLET test is not a substitute for the spark test, but an excellent supplement.

Alloy steels readily identifiable by the spark test are not easily distinguished by the pellet test.

Conversely, steels whose identification is doubtful by the spark test can be distinguished beyond possibility of error by the pellet test.

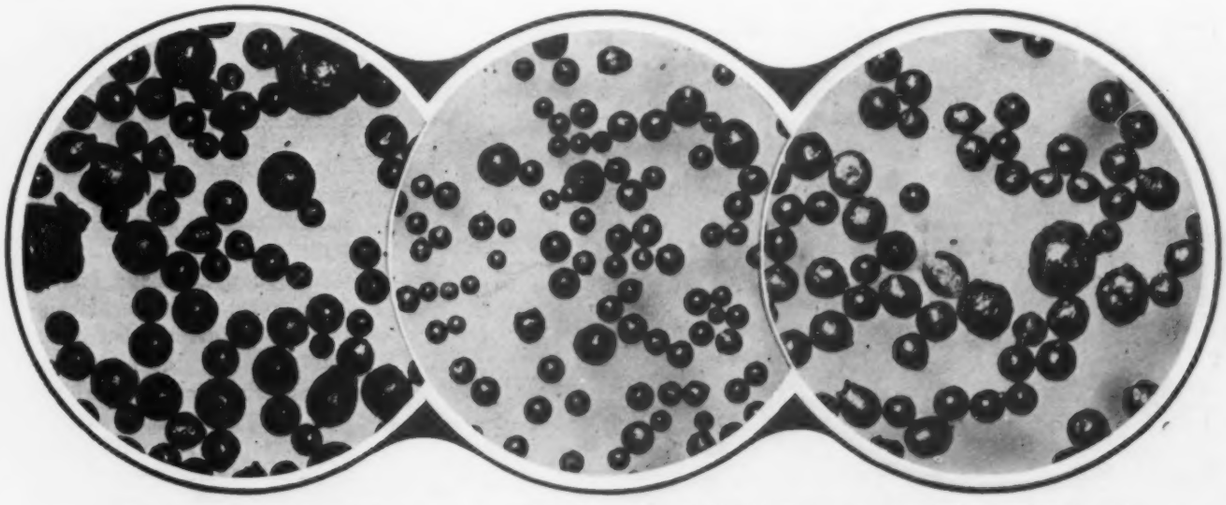
ALTHOUGH the "pellet" test for identifying alloy steels is a very recent development, it has already given evidence of valuable possibilities as an adjunct to the spark test. As a matter of fact, it is what may be called an outgrowth of the spark test, since it originated from certain effects noted during an investigation of physical and chemical aspects of spark phenomena.

During the course of the investigation microscopic examinations were made of the cold residue, or dust, collected from the spark streams of different alloy steels. It was found that the dust was really made up of two distinct types of particles — one, which was in the majority, resembling first cut machine turnings, and the other in the form of small globules, or pellets.

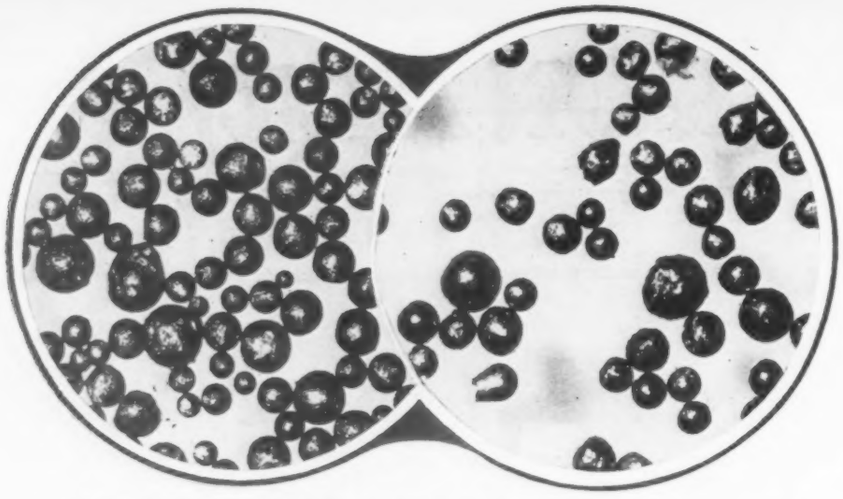
Pellets Are Globules Driven Off by Grinding Wheel

The former were apparently particles of metal torn off by the action of the grinding wheel, but not affected by heat, or chemical reaction. The pellets, however, had quite evidently been heated, at least to the

*Metallurgical engineer and chief chemist respectively of Timken Roller Bearing Co., Canton, Ohio. This article is a further elaboration of an article by the same authors in THE IRON AGE, Oct. 10, 1929.



PHOTOMICROGRAPHS (30 X) of Pellets: Fig. 1 (Left) Represents an S.A. E. 1095 Steel (1% C), with Fig. 2 (Center) an S. A. E. 1015 Steel (0.15% C) and Fig. 3 (Right) an S. A. E. 1045 Steel (0.45% C)



PHOTOMICROGRAPHS (30 X) of Pellets: Fig. 4 (Left) Represents an S. A. E. 52,100 Steel (1% C., 1.25% Cr. and Fig. 5 (Right) an S. A. E. 5145 Steel (0.45% C., 1% Cr.)

point of plasticity, and a chemical reaction, due without doubt to the heating, had taken place. It was assumed from their appearance that these particles played an important part in the production of the characteristic spark phenomena.

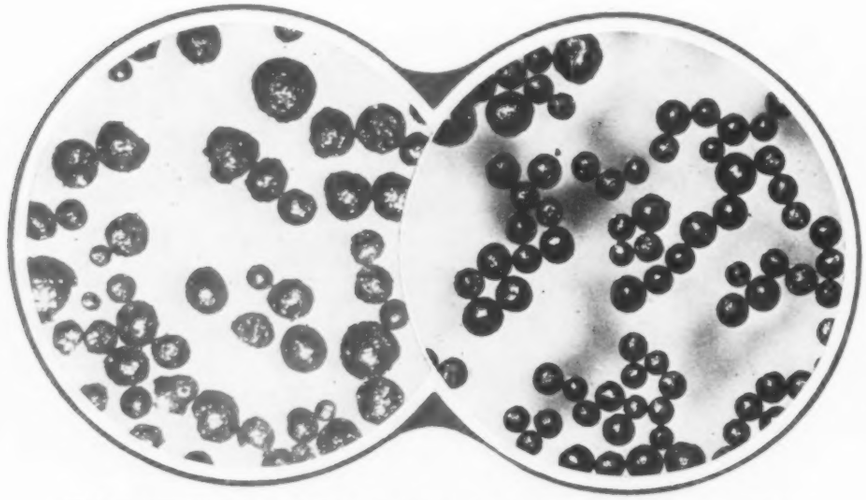
Given the correctness of this assumption, the next step was perfectly logical. In other words, if the presence of different alloys in the steel affected the spark, would they not also affect the appearance, or some other characteristic, of the pellets? Brearly and Pitois had both reported that if a glass slide were held in the spark stream the splashes, or as termed by Pitois, the "incrustations" of the particles on the glass would show a structure that would vary for different alloys.

The writers were unconvinced of the accuracy of this method of identification, for several reasons. For one thing, microscopic examination of the incrustations from several steels failed to show any readily recognizable difference. This is hardly surprising, since so many of the particles are not subject to any chemical reaction, and therefore are worthless as indicators. For another, which developed later, there was every possibility that the recognizable characteristics of the pellets which had changed chemically would be destroyed, or altered past recognition, by the force of their impact on the glass.

Separating Pellets From "Turnings"

Earliest examination of the cold pellets, however, gave indications of rather remarkable results. But, first, it was found necessary to perfect a technique for making a detailed examination, since that of the entire mass of residue was not particularly satisfactory. The pellets are usually in the distinct minority, and the presence of a large mass of "turnings," or unoxidized particles, made it difficult to examine them closely.

This was soon remedied by the development of a simple, but very effective, method of separation and segregation. A large sheet of white paper is held about 30 in. from the grinding wheel, in a plane that cuts across the spark stream near the end of its trajectory. As soon as a sufficient quantity of dust has collected on the paper, the latter is shaken to concentrate the whole mass in a small area. The paper is then tilted, and, since the pellets are rounded, while the "turnings" are very irregular in shape, it is a simple matter to roll the pellets off on to another sheet of paper, leaving the "turnings" behind. This procedure has been refined to secure a more uniform size of pellet by passing the whole collection through a 100 mesh sieve. The sample is then transferred to the hollow of a glass microscope slide for examination.



PHOTOMICROGRAPHS (30 X) of Pellets: Fig. 6 (Left) Represents a Steel Containing 1% C. and 1.25% Va., While Fig. 7 (Right) Shows an S. A. E. 6195 Steel (1% C., 1% Cr. and 0.15% Va.)

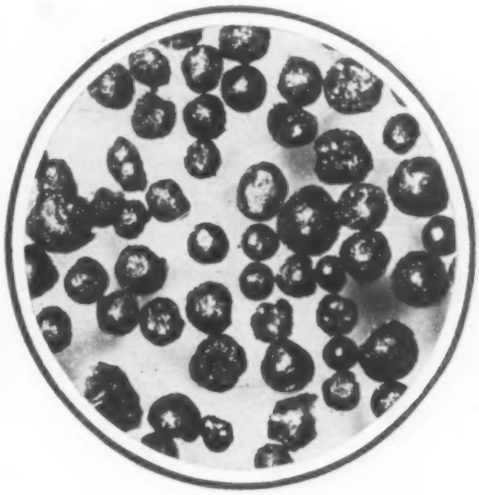
Vary Widely in Shape and Color Due to Alloy Content

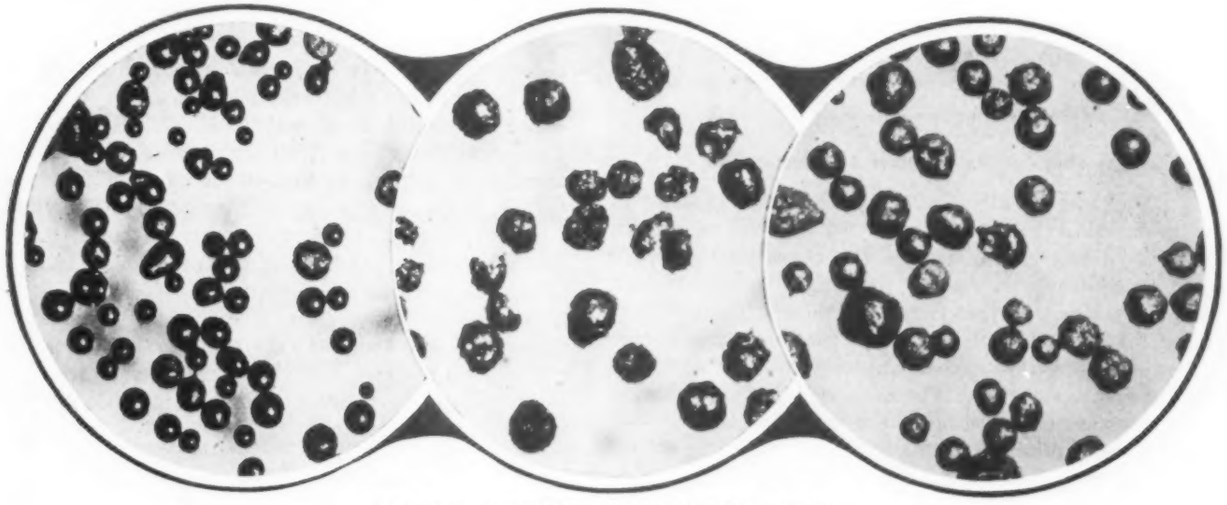
So much for the technique. It was found that the pellets obtained from various alloys vary widely both in shape and in the texture and color of their surfaces. They apparently follow a readily identifiable form, the characteristics for any given pellet being determined by the alloy content of the steel in conjunction with the amount of carbon present. The uniformity of these characteristics has been thoroughly checked and rechecked by countless examinations, that have shown no variation in any of them. The

peculiar thing about the results was the fact that steels readily identifiable by the spark test are not easily distinguished by the pellet test. Conversely, steels whose identification by the spark test is doubtful at best can be identified beyond any possibility of error by means of the pellet test. The table has been prepared to show the interlocking character of the two tests.

This can probably be brought out most clearly by a consideration of the pellets themselves, with special regard to their characteristic appearance. Those selected for discussion come in a group of steels not readily identifiable by the spark test, but accurately segregated by the pellet test.

Pellets from a high-carbon steel without other alloys (1095) have been selected as a control specimen, these being shown in Fig. 1. It will be seen that the pellets are quite uniformly round, or at least rounded, the surface is smooth, with an almost polished appearance, and the color is very dark. The color is one of the characteristics of pellets from carbon steel.





PHOTOMICROGRAPHS (30 X) of Pellet: Fig. 8 (Upper) of an S. A. E. 4195 Steel (1% C., 1% Cr., 0.15% Mo.)

* * *

PHOTOMICROGRAPHS (30 X) of Pellets: Fig. 9 (Left) Represents an S. A. E. 4615 Steel (0.15% C., 1.75% Ni., 0.25% Mo.) with Fig. 10 (Center) an S. A. E. 4615 Steel Carburized and Fig. 11 (Right) an S. A. E. 3312 Steel Carburized (0.15% C., 1.50% Cr., 4% Ni.)

Chromium Makes Pellets Gray and Round

At this point it might be mentioned that the carbon content of plain carbon steels apparently has but little effect on pellet characteristics. This is brought out in Figs. 2 and 3, which are pellets from 1015 and 1045 steels respectively. Comparing them with the pellets in Fig. 1 shows that the characteristics are practically uniform for all three. But, on the other hand, these steels fit into the category of those readily identifiable by the spark test, and the pellets are easily distinguished from steels of the same carbon content that have other alloys present.

For example, take a steel with 1 per cent carbon and 1 per cent chrome (52,100) as compared to 1095, which has no chrome. An examination of Fig. 4 which shows pellets from such a steel, makes the difference quite evident. The pellets are uniformly round, and smoother, but the greatest distinction is one of color. The presence of chrome imparts a gray, frosted appearance to the surface of the pellets which is found in no other case.

This distinctive characteristic of chrome pellets diminishes somewhat as the carbon content goes lower, but it is still present to a degree that enables easy distinction between 5145 and a 1045, as can be seen from a comparison of the pellets in Fig. 5, which are from a 5145 (0.45 per cent carbon, 1 per cent chrome) with those in Fig. 3, which are from a 1045 steel. The same is true in the case of 5120 and 1020. There is another characteristic of chrome that is worth mentioning. As the percentage goes up the shape of the pellets changes; they are almost perfectly round with 1 per cent chrome; at 2.5 per cent they start to become irregular and at 4 per cent they are decidedly lumpy in appearance.

Vanadium Forms Truncated Shells

Alloys of the vanadium group are difficult to identify by the spark test, but they are remarkably easy by means of the pellet test. Fig. 6 for example shows pellets obtained from a special steel having 1 per cent carbon and 1.25 per cent vanadium. This steel was

chosen principally because it gives such a clear idea of what may be called the basic vanadium characteristics.

An examination of the pellets shows that in every case oxidation, or some other chemical reaction, has been carried to a point that has left the pellets mere truncated shells, the inside being hollow, and the end blown off. The color is jet black, and the surfaces are heavily pitted, with a somewhat polished appearance.

Table of Comparative Fields of Spark and Pellet Tests in Sorting Alloy Steels

Steels	Spark Test	Pellet Test
1015 and 1095	Yes	No
4615 and 1095	Yes	No
1015 and 4615	Yes	No
1095 and 52100	Doubtful	Yes
1045 and 5145	Doubtful	Yes
6195 and 1095	Doubtful	Yes
6195 and 52100	Doubtful	Yes
4195 and 6195	Doubtful	Yes
4195 and 52100	Doubtful	Yes

Pellets shown in Fig. 7 are interesting as showing that the pellet characteristics of any alloy are never altered beyond recognition by the presence of other alloys with characteristics of their own. This example is a 6195 steel having 1 per cent carbon, 1 per cent chrome, and 0.15 per cent vanadium. Examination will show that the characteristics of both chrome and vanadium are present. The pellets have the characteristic frosted surface of chrome (see Fig. 4) combined with the blown out interior which is characteristic of vanadium.

Alloys of Molybdenum Are Remarkable

Molybdenum alloys offer a remarkable example of the interlocking of the spark test and the pellet test. In the lower carbon ranges the characteristic spark of molybdenum is readily recognized by the trained spark tester. In this range the pellets, however, are not readily distinguishable from those of straight carbon steel. As the carbon approaches 1 per cent, the situation is reversed. The molybdenum spark characteristics are obscured but the pellet characteristics become easily distinguishable.

Fig. 8 is a group of pellets obtained from a 4195 steel, containing 1 per cent carbon, 1 per cent chrome, and 0.15 per cent molybdenum. The characteristic frosted surface of chrome was still present, but the shape of the pellets was entirely different, as can be seen by a comparison with the pellets in Fig. 4. The characteristic of molybdenum seems to be a pellet having a slightly hollow, hemispherical form, the surface of the hollow being rough while the outside surface is comparatively smooth. Unfortunately this is not too clear in the photomicrograph because the pellets tend to rest on the flat surface, but some of them show it quite plainly. This determination has been checked over and over to make sure that the shape is due to molybdenum alone, and the conclusion has been reached that it is.

Carburized Steels More Easily Identified

One fact remains concerning the pellet test that proves its value as an adjunct to the spark test. Ordinarily with the latter it is extremely difficult to sort carburized steels accurately because the presence of a high percentage of carbon in the case destroys or obscures the characteristic spark phenomena of the other alloys. In the case of the pellet test, conditions are reversed.

As has been said earlier in this discussion the pellet characteristics become more and more accentuated as the percentage of carbon content rises. This may or may not be due to greater heat resulting from the increase in carbon. Be that as it may, pellets from carburized steels show great accentuation of the alloy characteristics, so that identification of carburized steels is actually easier instead of more difficult.

Characteristic Shape Found Only in Conjunction With High-Carbon Content

This is borne out by the two groups of pellets shown in Figs. 9 and 10 respectively. Both are from a nickel-molybdenum (4615) steel, the former uncarburized and the latter carburized. As has been said, however, the characteristic shape is only found in cases where there is a comparatively high carbon content in conjunction with the molybdenum. A low-carbon molybdenum steel pellet will show a structure similar to those from 1020 and 1095 steels. This is apparent in Fig. 9. In Fig. 10 the effect of the excess carbon in the case is perfectly evident; the molybdenum characteristics are greatly emphasized. As a further check on the effect of carburization, Fig. 11 is offered as a comparison with Fig. 10. The former shows pellets taken from a carburized nickel-chromium steel, and shows the chrome characteristics very plainly. So much so that there is no chance for error in distinguishing between the nickel-molybdenum and nickel-chromium pellets.

Test Has Proved Its Practical Value

All this may seem interesting academically, and of a somewhat doubtful value from a practical standpoint. As a matter of fact, the test has already proved its practical value in several instances. It is comparatively simple to devise a technique for examination that will compare favorably in speed and cheapness with that developed for spark testing. And, furthermore a set of standard pellets covering the essential S.A.E. steels can be easily prepared, and preserved for reference purposes, that will add much to the effectiveness of the method generally.

Preparation and Use of Standard Pellet Slides Essential

In preparing these standards it is suggested that each sample be placed between two glass microscope slides, which are then glued together. The slides can then be indexed and filed in an ordinary slide box. On the whole, considering the ever growing necessity for accurate and reasonably cheap methods of sorting steels, the pellet test seems to have a very definite place in practice. It cannot ever take the place of the spark test, but as a supplement its value seems unquestionable.

Casting Shake-Out. The conveyor line takes the castings at once to sand-blast department

Straight-Line Cleaning of Castings on Conveyors

BY E. F. MILTENBERGER*

SUPPLEMENTING the article on molding and pouring practices at the plant of Eastern Steel Castings, Newark, N. J., which was published in the March 27 issue of THE IRON AGE, the story of handling the castings between pouring and shipping is one of great interest and suggestiveness. Rarely is a period of more than three to four days permitted to elapse from the time a casting is poured until it passes through the shipping department. This is in contrast with operations under the old methods, so long in vogue in this industry, whereby castings are cleaned in the order in which it is most convenient and, correspondingly, some are delayed, through getting to the bottom of the pile, by periods which frequently stretch into weeks.

All of this confusion and delay, with the coincident difficulty of keeping customers satisfied and of keeping track of castings and parts of orders, is avoided by the methods now in use. This is part of a general revamping of the entire system, whereby the production of castings has been put upon a manufacturing basis under close control.

Three transit conveyor lines, with occasional short lines for special purposes, run the length of the cleaning department. These consist of rows of gravity rollers made of seamless steel tubing mounted in ball bearings, sealed against entrance of abrasive matter. They are operated so easily that a man can shove several tons of weight along such a conveyor with little effort.

A complete system of weighing and checking of weights pervades the entire plant, from the time the casting leaves the shake-out grating until it is shipped to the customer. Sprues and risers going to the open-hearth furnace are weighed at point of cutoff. Castings are weighed box by box before grinding and afterward, as the grinding labor is compensated in large part on the basis of the amount of metal removed. This checking of weights all along the line follows a carefully thought-out and pre-determined schedule, whereby the management knows every day just what the previous day's operations have been in production, parts in process, unfilled orders, partly filled orders, etc.

Shake-Out Is Starting Point

Cleaning properly begins on the shake-out. The inclined, shaking grating on which sand and castings are dropped brings the castings down within reach of a man with a hook. He hooks them off into boxes on skids running on the roller conveyor system. As soon as a box is full it passes immediately to the first cleaning operation, which consists in getting rid of the gates and risers. Depending upon the size, these are burned off with an acetylene torch or cut off in a sprue-cutting machine.

Minus their major appendixes, the castings then pass on to the general cleaning division, which includes sand blast, grinders, chippers, tumbling barrels, welders, etc. All castings are inspected before they reach the sand-blast unit. A goodly percentage of all discards goes out at this point, as the inspectors' bonus begins only after 75 per cent of all the day's defectives are discarded here.

*President, Eastern Corporation, Graybar Building, New York; formerly vice-president and general manager, Eastern Steel Castings, Newark, N. J.

Castings small enough so that the sprues and risers may be handled in a sprue-cutting machine go to that unit, the heads and gates being thrown at once into an open-hearth charging box on an adjoining line of roller conveyor. The castings themselves are then thrown upon the loading table for the sand-blast barrel. Larger castings go to the sand-blast turntable for blasting at once. Thence they pass across an inspector's table, from which they are pushed off into a box passing underneath on a line of conveyors.

These larger castings are weighed as they enter the burn-off department. Sprues and risers burned off then go into open-hearth charging boxes, which again are weighed. The burner operator throws the castings into boxes on what are known as classifying conveyors, consisting of two lines of roller conveyors, which may accommodate a dozen or more boxes at one time. Leaving this department, these castings are weighed out and the weight thus obtained is that of net castings.

Passing Through Cleaning Operations

From the three main transit lines boxes of castings are switched off on to transverse side tracks for the grinding operations necessary. The smaller castings go at once to a row of stand grinders, where the operator works from a full box into an empty box. Each box, when filled with ground castings, is shoved back upon the main transit line.

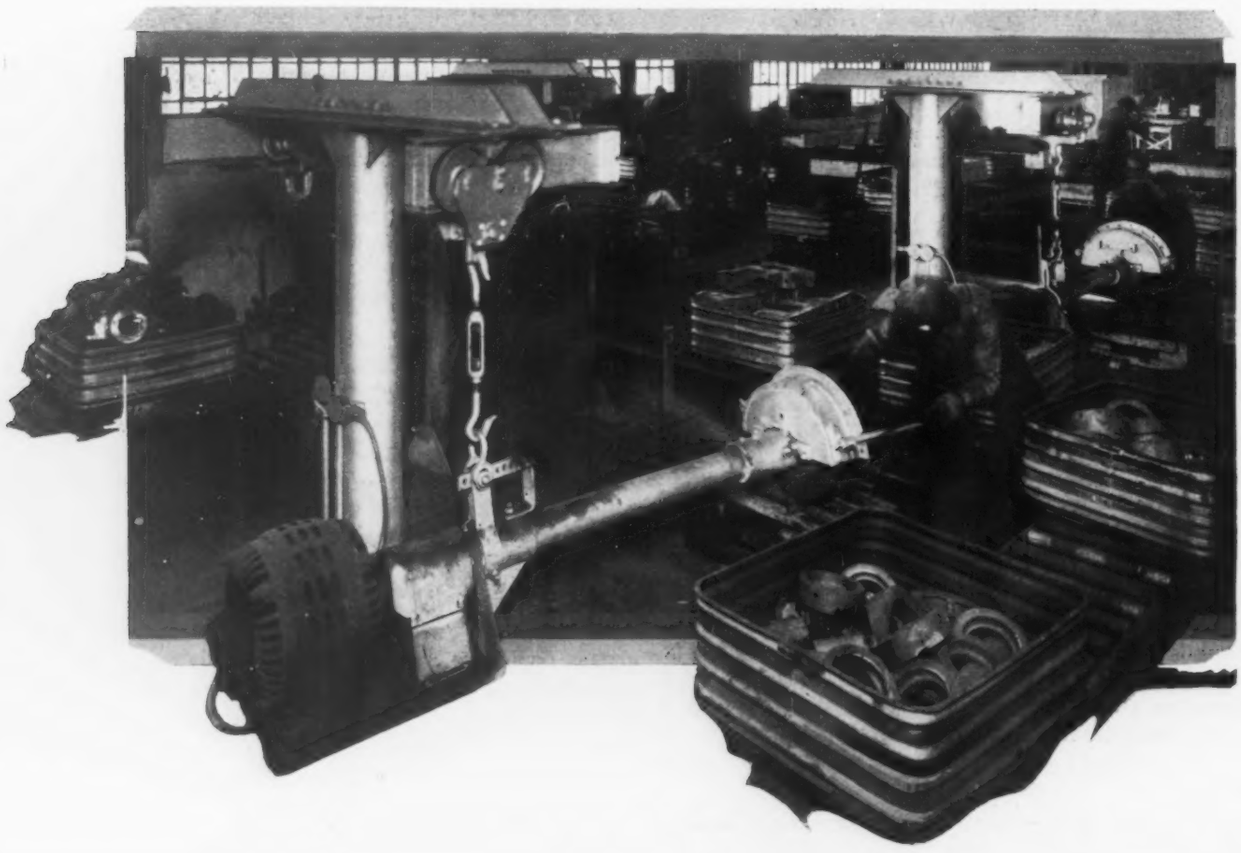
Larger castings go to the swing grinders, which are grouped in pairs. Each stand or pedestal has two grinders, one at either side, and it is fed from both sides. Ground castings from the swing grinders follow the same procedure as the smaller castings, in getting back on the main transit line after the grinder is through with them. Both sets of castings are weighed again after grinding, as the grinders' pay is based upon the amount of metal ground off.

Several types of grinders are in use, the stand grinders, usually with two high-speed wheels, employing two men. The innovation in the swing grinders lies in the two direct driven units on each stand or pedestal and in the way each grinder is balanced. These grinders are located between the main lines of conveyors running through the department, there being one row of grinders between the first and second lines of conveyors and another row between the second and third lines.

Each stand is served by a short transverse section of rollers holding one or more boxes. Castings are commonly taken from one box, passed through the grinding operation, and returned to a second box which, when filled, is sent out along the main line.

Chippers work in groups of two, each on his own table, with an inspector between the two tables. The table is a sort of double bench of concrete, with a top surface of wooden paving blocks. Each casting, as the chipper finishes with it, is shoved across the table toward

SWING Grinders in the Cleaning Department Taking Care of Medium-Weight Castings. Note the suspension, permitting adjustment of the balance and of the height of the wheel



PRIMARY Repairs (Above)—Electric or Gas Welding, with Swing and Stand Grinding and Chipping—Are Available Prior to Annealing. Here the fifth inspection takes place (man in right foreground). Unloading Tumbling Mills, by Crane When Necessary, to Classification Benches and Sixth Inspection (Below). Man in foreground is weighing out finished castings

the inspector (incidentally, this is the fourth inspection in the cleaning department). Thence, from the bench the castings are classified into waiting boxes on a cross-line of conveyor. This classification involves three groups of boxes—one for castings going to the annealer, one for those going for minor repairs to the electric welder and one for the acetylene welder.

Repairing Castings En Route

After welding has been done upon such castings as need it, they pass through stand and swing grinders and chippers in the repair department. Following a fifth inspection, the castings are sent into the annealing line. In all of this work there is no backtracking. The progress is definitely toward a specified point and each casting takes its course along the stipulated lines of travel.

After annealing, the castings are rumbled. Large castings are placed in the rumbling barrels by means of a crane, while small ones, handled in boxes, are passed into the barrels from the boxes. Another classifying, included with the sixth inspection, determines whether any castings require further repair. In cases where this is necessary they are sent to the secondary repair department, which is a complete unit in itself. Following this the castings get back again into the main line toward the shipping floor, along with those castings on which no secondary repair was found necessary.

Repairing of castings, a well-developed feature in the making of steel castings, is done largely by either electric or acetylene welding. There are several pieces of equipment adapted to these processes and located conveniently with regard to the cleaning conveyor lines. Boxes of castings requiring this treatment are taken off the main lines as they pass, on their route to the shipping department. After undergoing such repairs as are necessary they proceed immediately on their way.

A secondary repair unit, in a wing of the main building, takes care of any repairs required after annealing. This department is equipped with all the necessary devices for carrying on a complete repair, including grinders, chippers, welders, etc.

By handling castings thus virtually in the order of their production, the previous trouble, from their piling up and certain castings being hidden at the bottom of the pile, is obviated. It is, of course, perfectly feasible, on a rush order, to push through a box of castings out of its regular turn. The production methods in vogue, however, are so adjusted in speed that customarily no such treatment is needed.

SAND-BLAST Department, with Turntable and Car Rooms. Inspector at left of turntable puts castings directly into boxes which reach him on the line running under his table. They proceed toward the left and are weighed in to the burners

Inspection of the castings begins, as already noted, before the gates and risers have been removed. The inspection is repeated after each successive major operation until they are ready for shipment. The great run of items comprising the product have six inspections, at any one of which the casting may be thrown aside for repair or rejection. Efforts are made to avoid doing work on a defective casting. The sooner its defect is discovered, the less is the expense involved. Hence, these inspections are rigid and searching.

Skids Help in Assorting for Shipment

Use is made in the shipping department of a large number of sheet steel trays or skids. These are set on blocks in such manner that the nose of a lift truck may be run under for picking them up. They constitute not only handling units, but what is perhaps more important at this point, sorting or assembling units, whereby pieces of the same pattern or going to the same destination may be brought to-

SECONDARY Repair Department Is a Complete Unit in Itself

gether and an order thus completed.

This department is served by a railroad spur and also by facilities for handling motor truck shipments, which constitute the greater portion of the outgoing tonnage, as the business is largely localized. Overhead crane service is available here, both for heavy castings and for handling skid loads of smaller castings.

Nowhere along this line, from the shake-out to the shipping room, is there an accumulation of work. The equipment now installed is adequate to care for present needs as fast as the tonnage is provided. There is room for expansion in the cleaning department, amounting to duplication of its capacity, by means of an added group of three more lines of main conveyors in the adjoining bay.

As was made clear in the first section of this article, the work is almost wholly jobbing. Few orders call for more than 50 castings from a single pattern, and the variety changes daily.

FOURTH Inspection Occurs at the Chipping Department. Ground castings are shown being weighed in, at two points. The inspector (A) takes care of chippers on two benches, between which he stands

A Machine Tool Builder's Experi

ALL in all, the experience of William Sellers & Co., Inc., indicates that in metal cutting, tungsten - carbide tools have great possibilities. But there are many limitations and these must be thoroughly understood if the material is to be used successfully. In addition, there are defects and inherent weaknesses still to be overcome by the producers of this material.

CUTTING TOOL RECORD

WM. SELLERS & CO., INC.

TO BE FILLED IN BY FOREMAN OR RATE SETTER

Tool Serial No. _____ Cutting Tool Name or Symbol _____

Material Cut _____ Machine on which Tool is used _____

Cutting Speeds	Feeds	Depth of Cut	Condition of Tool After Cut

Time Tool was in Use _____ Cubic Inches of Metal Removed _____

Order No. _____ Pc. No. _____ No. of Pcs. _____

Name of Piece _____

Remarks _____

TO BE FILLED IN BY OFFICE

Mfgr. _____ Shape or Style _____

Size of Shank _____ Size of Tip and Method of Holding _____

Fig. 1—Records Are Kept for Each Job Using Tungsten-Carbide Tools

The Sellers shop does not engage in quantity manufacture. Except for two or three small machines which are produced in lots of 25, most of the work is in quantities of 2 to 12, the larger pieces—up to 40 tons in weight—being built singly or in pairs. Machine operations are paid for on a piece-work basis, so that in applying the new tools to the various operations the rate setter has had to work with the machine operators. When the first tungsten-carbide tools were purchased and placed in the shop a member of the supervisory force was assigned part time to follow them up. He worked with the manufacturer's applications men in recommending jobs on which the material should be used. He investigated failures, which if due to the set-up or to the machine operator, he corrected accordingly. If the fault lay elsewhere, he worked with the manufacturer's representative to correct it.

Tungsten-carbide tools are carried in the toolroom, from which any operator can draw them upon proper authorization in writing from his foreman. The foremen are sufficiently familiar with these tools to know where their use is desirable. New applications are followed up by the tungsten-carbide expert and if adopted, the rate department adjusts the piecework price accordingly. For certain jobs the standard operation sheets specify use of tungsten-carbide tools.

Before a machine operator starts to use these tools he is given written instructions in blueprint form. While the tools are in the experimental or development stage, a "Cutting Tool Record," Fig. 1, covering each job, is filled out by the foreman or rate setter and forwarded to the engineering depart-

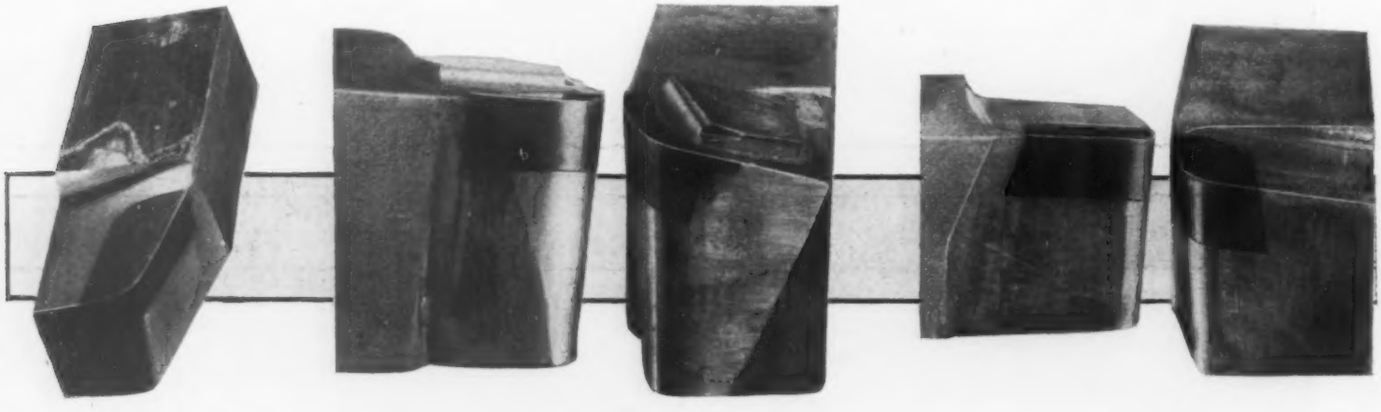


FIG. 3 FIG. 4 FIG. 5

FIG. 3—Typical General-Purpose Tool. The tip is so set into the shank that it is supported firmly on the bottom and backed up on one side and the rear. This tool, perhaps the most commonly used, is successful in moderate cuts. Fig. 4—Bridge tool for heavy roughing. Holds the tungsten-carbide tip securely but the projection or bridge on top makes grinding difficult and interferes seriously with the chips on heavy cuts. Fig. 5—Dovetail tool for heavy roughing.

ence with Tungsten-Carbide Tools

WHEN first introduced at the plant of William Sellers & Co., Inc., Philadelphia, about two years ago, tungsten-carbide cutting tools, because of application difficulties, were opposed by many of the machine tool operators.

Today, these operators complain if such tools are not available when wanted.

Application of these tools in the Sellers shops has been confined for the most part to machining cast iron. They are used on engine lathes, turret lathes, boring and turning mills of all sizes, horizontal boring machines, and on planers, both large and small. All such tools are machine ground by one "experienced" man and are issued from the toolroom as other tools. Performance records are kept, and where found profitable tungsten-carbide tools are specified on the standard operation sheets. Thus for many operations use of these tools has become part of the regular shop routine.

Experiences with this new tool material are outlined in this article, which is abstracted from a paper presented by Coleman Sellers, 3rd, executive engineer of the Sellers company, at the semi-annual meeting of the American Society of Mechanical Engineers in Detroit,, June 9-12.

ment through the superintendent. Each tool is given a serial number, and by means of report cards describing the tool, date of purchase, etc., a close check is kept on its performance and its profitableness. Those that are not proving economical are immediately investigated.

Proper grinding of the cutting edge has been found very important to the success of these tools. A keen edge (one that does not show irregularities even under a magnifying glass) is essential for all but the heaviest roughing operations; even for the latter a much sharper tool is desirable than when using high-speed steel.

Clearance angles should be somewhat less than those adopted as good practice for high-speed steel because the inherent lack of strength of tungsten-carbide necessitates supporting the cutting edge of the tool as rigidly as possible. With some types of brazed tools, especially those subjected to heavy cutting pressures, it is desirable to grind a slight negative back slope on the top of the tool. This tends to hold the tips in place, and offsets the tendency to pull away from the shank.

Hand grinding has been eliminated entirely by the company. Furthermore, the machine operator is not permitted to grind his own tools, because under such conditions it would be impossible to control the quality of the grinding or assure use of the correct rake and clearance angles. All dull tools are returned to the toolroom, where they are ground by an experienced operator.

Hand grinding not only tends to produce mediocre results, but it is slow and expensive, said Mr. Sellers. Tests are said to have shown that grinding by hand takes three to four times longer than by machine, to produce an equally good cutting edge. This is partly accounted for by the fact that with hand grinding it is necessary to rough on a 60-grit wheel and finish on a 100 or 120-grit wheel, whereas with the machine it is necessary to employ only one wheel of 60 or 80-grit.

Machine Grinding Permits Use of Water

Another advantage of machine grinding is that it permits the use of water, which speeds up the operation. Hand grinding cannot be done wet with any degree of satisfaction, because the quantity of water required would obscure the tool from the eyes of the operator, besides necessitating continual wetting of his hands, producing unpleasant and in cold

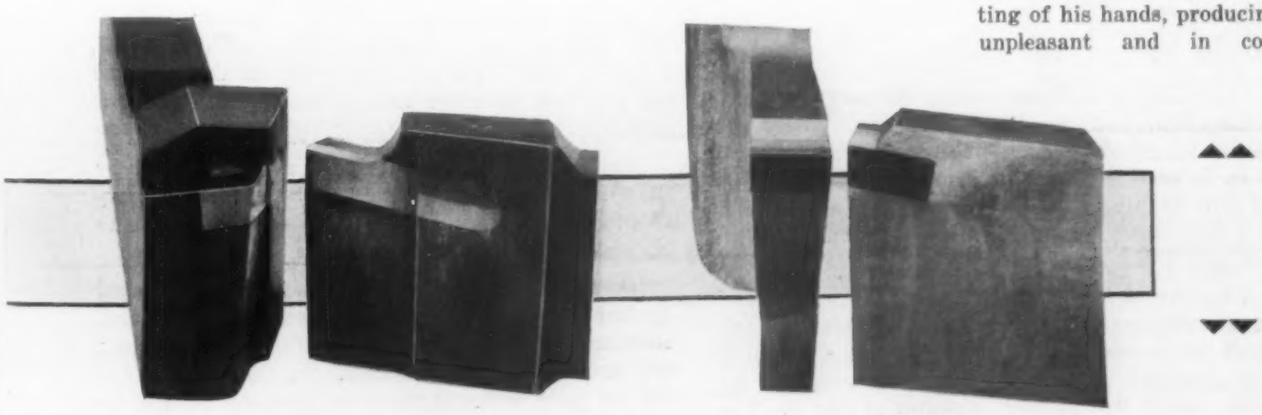


FIG. 6 FIG. 7

Considered the most satisfactory of all because the tip is accessible for any required depth of cut and for grinding. Fig. 6—Tool for general work. This holds the tungsten-carbide tip satisfactorily, but unless the shank is ground away the depth of cut is too limited and only light cuts may be taken. Fig. 7—Finishing tools of this type have proved very satisfactory

weather almost impossible working conditions. A little water is worse than none, because it tends to injure the tungsten-carbide by alternate heating and cooling. If water is used it should be in abundant quantity, at low velocity and directed to the part of the tool in contact with the wheel. A further advantage is elimination of the abrasive dust, which in heavy cutting is serious because of the excessive wear of the soft wheels required to grind tungsten-carbide.

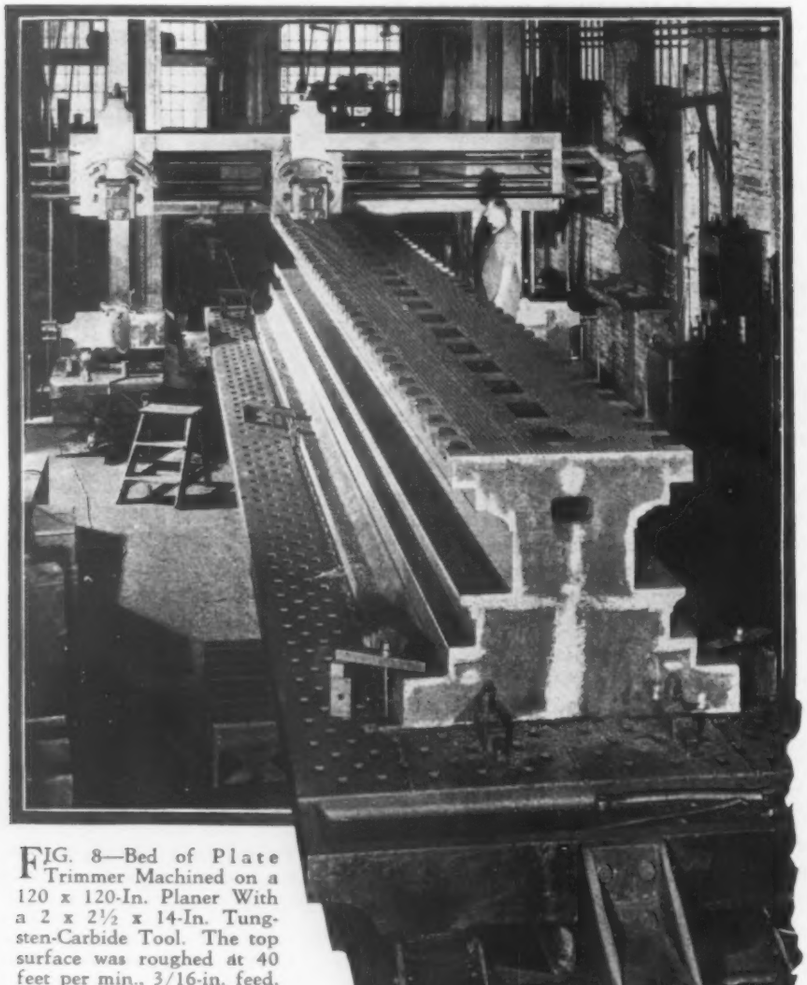


FIG. 8—Bed of Plate Trimmer Machined on a 120 x 120-In. Planer With a 2 x 2½ x 14-In. Tungsten-Carbide Tool. The top surface was roughed at 40 feet per min., 3/16-in. feed, ⅜-in. average depth of cut. The scale on this casting was bad, and the cut was intermittent

The grinding machines used in the company's preliminary tests, and later in regular practice, were two Sellers tool grinders, one of them for tools over 1½ x 2-in. in section. Time of grinding varies from 35 min., for shaping out a very rough tip placed on a 1½ x 2-in. shank, to 3 min., for touching up two surfaces of a tool.

A variety of tool shapes are used. Manufacturers' recommendations have been found satisfactory, although not necessarily the most efficient. A grinding chart prepared as instructions for operating the smaller Sellers tool grinder is shown in Fig. 2. The offset tools shown in Figs. 9 and 10 of this chart are good all around roughing tools, the curved cutting edge having an advantage for tungsten-carbide, inasmuch as the curved edge eliminates some of the shock which takes place on entering or leaving the cut.

In connection with this grinding chart, Mr. Sellers pointed out that in grinding the tools only slight pressure should be applied. A good operator, he said, soon gets the "feel" and will not attempt to hog off the tungsten-carbide. Under no conditions when grinding dry should a tool when heated from grinding be dipped into water.

Lapping after grinding will produce a keener cutting edge; but in machining cast iron no advantage has been found in this extra operation. After cutting a very short time a lapped tool has no better edge, even in finishing cuts, than a carefully ground tool that has not been lapped.

Too much emphasis cannot be put on the necessity for rigid holding of both the tool and the work. The shank must be of sufficient size for the pressure exerted in cutting and the tool must be supported as close to the cutting edge as possible. The machine tool should not have any lost motion in the tool-post or tool-apron, and the work must not spring. If these conditions do not obtain, chatter, the worst enemy of tungsten-carbide, will result.

Regarding intermittent cuts, thought by some to be impractical, Mr. Sellers pointed out that operations involving such cuts are being done at the Sellers plant every day. One example is the planing of plate planer beds, Fig. 8. There is no particular difficulty in using these tools on planers, but tool lifters should be employed so that the tool will not drag over the work on the return cut, with the danger of loosening the tip.

Various forms of the tungsten-carbide tipped tools are used by the company; some of them are shown in Figs. 3, 4, 5, 6 and 7. All tools are brazed to the shank, but some are also held by other means, brazing by itself not always being sufficient to resist high pressure.

Failures of tungsten-carbide, as experienced by the Sellers company, are said to be roughly chargeable to tip loosening, to soft tungsten-carbide, and to tip breaking or chipping.

Loosening of the tip seems to have been caused by improper brazing, which appears to have been corrected largely by the manufacturers of the tools; and also by improper backing. In this, the shanks did not have sufficient metal at the sides of the tip to prevent slight movement sideways, loosening the tip. The remedy is heavier shanks.

Tips are broken or chipped by having too light a shank; this allows the shank to bend and thus re-

moves the support from under the tip and causes it to crack. The tools chip and break also because of too much copper in the braze; the remedy lies in securing closer contact between tips and shank, allowing only 0.001 in. or 0.002 in. for the copper. Tips are broken or chipped by too great a clearance, which does not give proper support to the cutting edge.

Chatter caused by loose bearings on the machine tool, by shanks too light for the cut, by improper support for the tool, incorrect feeds and speeds or by incorrect tool angles is also a cause of tip cracking or chipping. If the chatter is of low frequency, it does not do much harm, but if of high frequency, it is usually disastrous to the tool.

Another cause of tip breaking or chipping is in not relieving the feed when breaking through the end of the cut. This applies to boring and turning where the cut is heavy and the material is hard. The feed should be lightened as the tool is about to run out of the cut; otherwise when the tool first breaks through, the spring in the shank will be relieved and the effect will be to increase the feed suddenly, tending to cause excessive pressure and tip breakage.

Heavy feeds on intermittent cuts is another cause of tool breakage. For instance, a square piece of work on a boring mill should not be roughed with a heavy feed until the cut becomes continuous. The gap between the cuts will allow the feed to accumulate and cause too great a shock when the tool strikes.

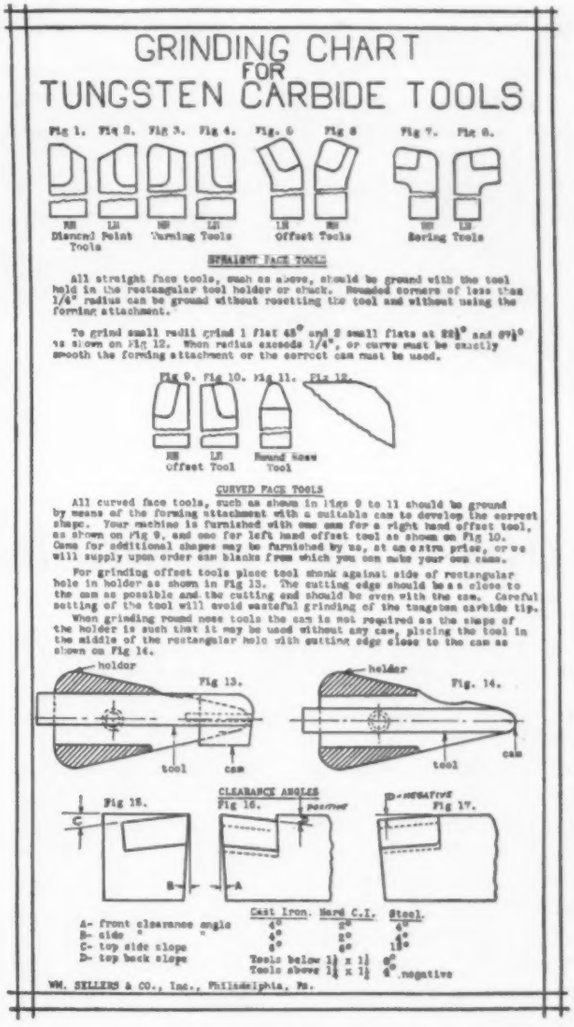

GRINDING CHART
FOR
TUNGSTEN CARBIDE TOOLS

Fig 1. Fig 2. Fig 3. Fig 4. Fig. 5 Fig 6 Fig 7. Fig 8.

RH LH RH LH LH RH RH LH
Diamond Point Tools — Turning Tools — Offset Tools — Boring Tools

STRAIGHT FACE TOOLS

All straight face tools, such as above, should be ground with the tool held in the rectangular tool holder or chuck. Rounded corners of less than 1/64" radius can be ground without resetting the tool and without using the forming attachment.

To grind small radii grind 1 flat 45° and 2 small flats at 22½° and 67½° as shown on Fig 12. When radius exceeds 1/4", or curve must be exactly smooth the forming attachment or the correct cam must be used.

Fig 9. Fig 10. Fig 11. Fig 12.

RH Offset Tool — LH Offset Tool — Round Nose Tool

CURVED FACE TOOLS

All curved face tools, such as shown in Figs 9 to 11 should be ground by means of the forming attachment with a suitable cam to develop the correct shape. Your machine is furnished with one cam for a right hand offset tool, as shown on Fig 9, and one for left hand offset tool as shown on Fig 10. Cams for additional shapes may be furnished by us, at an extra price, or we will supply upon order cam blanks from which you can make your own cams.

For grinding offset tools place tool shank against side of rectangular hole in holder as shown in Fig 13. The cutting edge should be as close to the cam as possible and the cutting end should be even with the cam. Careful setting of the tool will avoid wasteful grinding of the tungsten carbide tip.

When grinding round nose tools the cam is not required as the shape of the holder is such that it may be used without any cam, placing the tool in the middle of the rectangular hole with cutting edge close to the cam as shown on Fig 14.

holder — Fig 13. — tool — cam

holder — Fig. 14. — tool — cam

Fig 15. — CLEARANCE ANGLES — Fig 16. — positive — Fig 17. — negative

	Cast Iron.	Hard C.I.	Steel.
A- front clearance angle	4°	2°	4°
B- side " "	4°	2°	4°
C- top side slope	6°	6°	12°
D- top back slope	Tools below 1¼ x 1¼		6°
	Tools above 1¼ x 1¼		6° negative

WM. SELLERS & CO., Inc., Philadelphia, Pa.

Fig. 2—Instruction Chart Prepared for Use in Machine Grinding Tungsten-Carbide Tools

Increased Speed the Chief Advantage

Outstanding applications of the tungsten-carbide tools at the Sellers plant include the planing of large ring gear segments on a 72 x 72-in. planer; planing 10-ft. boring mill uprights on a 72 x 72-in. planer; and planing the bed of a floor boring machine on a 60 x 60-in. machine. Also, boring long half-bearings bolted together on a 5-in. horizontal boring machine and rough and finish turning and facing the table of a boring mill.

Mr. Sellers concluded with a summary of the advantages and disadvantages of tungsten-carbide tools as experienced so far by his company. These apply to cast iron, and may or may not apply to other materials, he said.

Increase in speed with the same feed and depths of cut, thereby removing more metal in a given time, was cited as the foremost advantage.

Sand and scale, which cannot be cut by high-speed steel, usually can be cut without harmful effect. Scale up to a hardness of 700 Brinell has been cut with the tungsten-carbide tools, but above that hardness the cutting edge becomes damaged and the tool breaks down. Hard castings which through some slip in the cupola charge or for other reasons turn out too hard for the usual cutting materials may be machined with tungsten-carbide tools and thus saved from a return trip to the foundry, for annealing, or from the scrap pile.

In long finishing cuts an advantage of tungsten-carbide is that the tool maintains its size throughout the entire operation. Much time is lost when there is even slight wear on a tool in the middle of such a cut, necessitating changing the tool and possibly starting the cut over again.

The high cost of the tools and the increased cost of grinding were cited as the foremost disadvantages of the new tools. The lack of strength of tungsten-carbide necessitates handling the tools with care; if the tools are dropped on a hard floor or knocked against a casting there is danger of chipping or cracking the tip.

In some cases no advantage results, and use of tungsten-carbide tools is a needless expense, said Mr. Sellers, referring particularly to cuts which are already at the limit of power of the machine tool. Unfortunately, many shops have machine tools which were built before production had reached its present great height, he said, and such equipment prevents its owners from making full use of this remarkable material.

"Tungsten-carbide is still in the development stage," Mr. Sellers continued. "Judging from the progress

(*Concluded on page 60*)

The "Grave Yard" of Old Cars at the Rouge Plant of the Ford Motor Co. at Dearborn. The cars, representing various makes, many of them obsolete, are awaiting their turn on the salvage line

Ford Scraps 375 Automobiles Each 16 Hr.; Even the Grease Saved

WITH the automobile industry as a whole searching for the best method of solving the problem of the old car and ridding the highways of discarded hulks, the Ford Motor Co. has conducted during the past few months an interesting experiment in scrapping automobiles, which the company announces has been found so practical that plans are being made for increasing salvaging facilities and continuing the work on a more extensive scale.

Under the auspices of the National Automobile Chamber of Commerce, other automobile manufacturers recently put forth a plan called the National Safety Highway Campaign for the purpose of meeting public complaints regarding the disfiguring of the landscape by abandoned cars.

The Ford plan, it appears, not only brings in the old cars that otherwise might be left by the roadside, but turns the old material that is recovered to useful purposes.

A force of 120 workmen is now employed at the Ford Motor Co.'s Rouge plant at Dearborn, Mich., dismantling old cars at the rate of 375 every 16 hr. It has wrecked 18,000 old automobiles by a disassembly method patterned after its famous assembly line for automobile production.

At Buffalo the Ford company is about to erect a new reclamation plant, where similar automobile scrapping methods will be employed, and presumably the old material will be sold to steel mills and other scrap consumers in that district or shipped by boat to the blast furnaces and open-hearth furnaces of the Ford plant in the Detroit district.

In its dismantling process the Ford company salvages many parts, such as tires, in their entirety. Some other materials are being converted into useful articles, while the iron and steel is remelted in the furnaces to do its bit in the manufacture of Ford cars and trucks.

Pays $20 for Old Cars

The derelicts are bought from Ford dealers at a fixed price of $20 a car. There is no restriction as to make, age or condition, except that all cars must have at least some semblance of tires and a battery.

Commenting on its plan, the Ford company says that "the salvaging of cars that have outlived their usefulness serves three ends. It will rid the highways of motor menaces that are dangerous both to life and traffic, it will to a large extent free the landscape from unsightly junk piles, and it will convert into usefulness material that would otherwise go to waste."

Experiments were begun by Ford engineers on Feb. 5. Three moving conveyors are now in operation in the open-hearth building. Two are used for dismantling purposes, one for Ford cars and one for cars of other make. The third carries scrap iron and

steel to one of the 10 open-hearth furnaces, and other salvaged material, such as batteries, tires and floor boards, to waiting trucks.

Gasoline, Oil and Grease Saved

The present method of scrapping is first to drain the cars of gasoline and oil, both of which are salvaged. Grease is also saved. The cars are then hauled into the open-hearth building and placed on a progressive conveyor. The headlight lenses and lamp bulbs are recovered, the spark plugs and battery are taken out and all glass is removed. Glass which is whole or may be cut to useful sizes is utilized for glazing in Ford plant buildings. The broken bits are sent to the Rouge glass factory for remelting. Floor boards travel to the box factory to be used for crate tops.

The cotton and hair obtained from upholstery and roof are separated, baled and sold. The muslin from car tops and the better grades of upholstery covers are made into buffer and polishing wheels. The imitation leather got from curtains and tops is immediately transferred to electric sewing machine operators near the conveyor line, to be transformed into aprons for use in the blacksmith and other shops. Smaller pieces and trimmings are fashioned into hand pads.

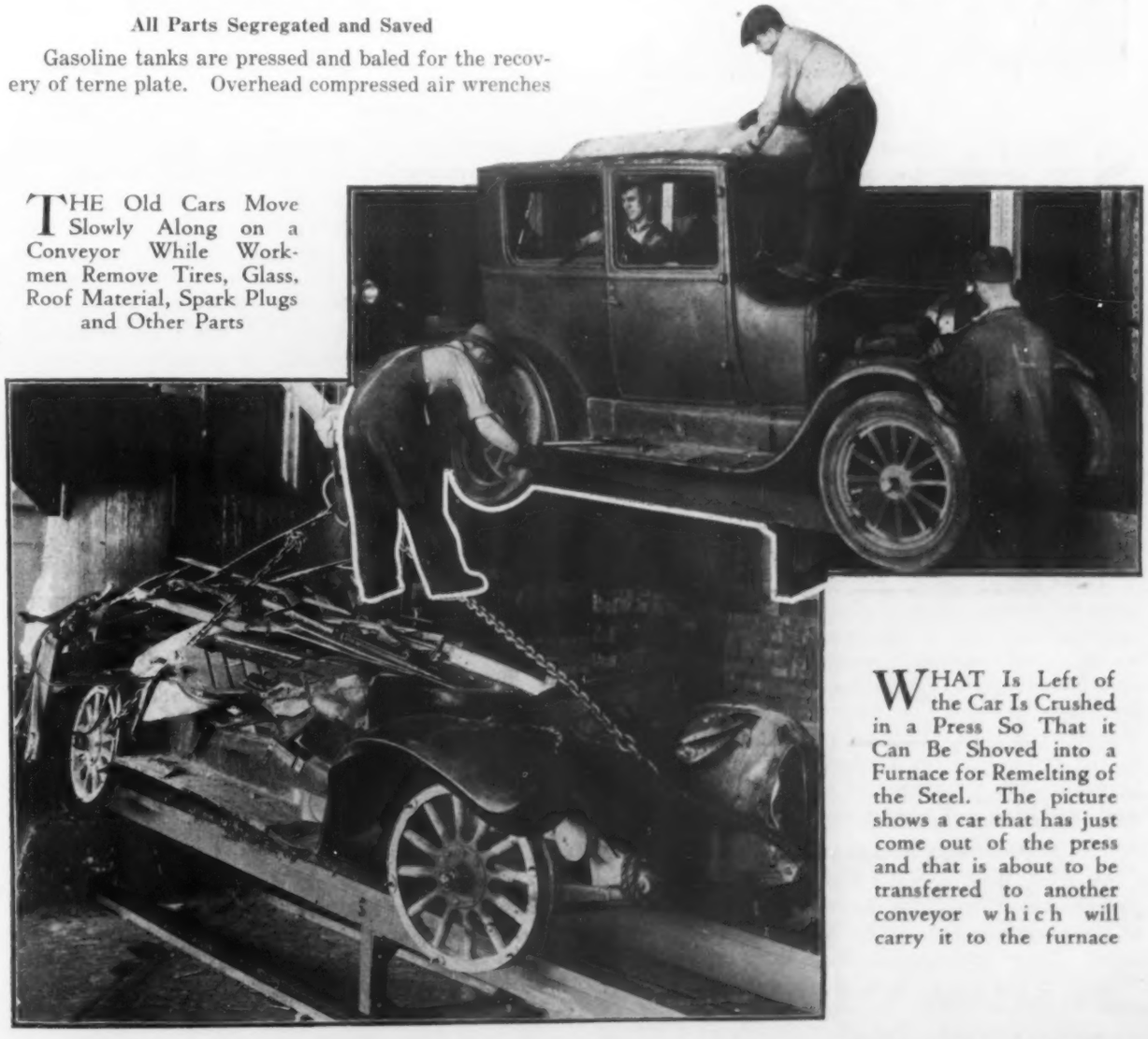
All Parts Segregated and Saved

Gasoline tanks are pressed and baled for the recovery of terne plate. Overhead compressed air wrenches that have been set in reverse unscrew the wheel nuts. When the wheels are removed the tires are inspected. If the tread is good they are sold as used tires at the commissary. Otherwise the entire unit is placed in automatic shears which sever both tire and rim. The tire is quickly stripped and tossed into a waiting cart to be sold as old rubber. The rims join others for use as furnace scrap.

Horns are salvaged. Likewise hubcaps for aluminum, ignition wire for copper, oil cups for brass, bushings for bronze and other bearings for babbitt. All metals are kept separated by depositing each kind in steel barrels.

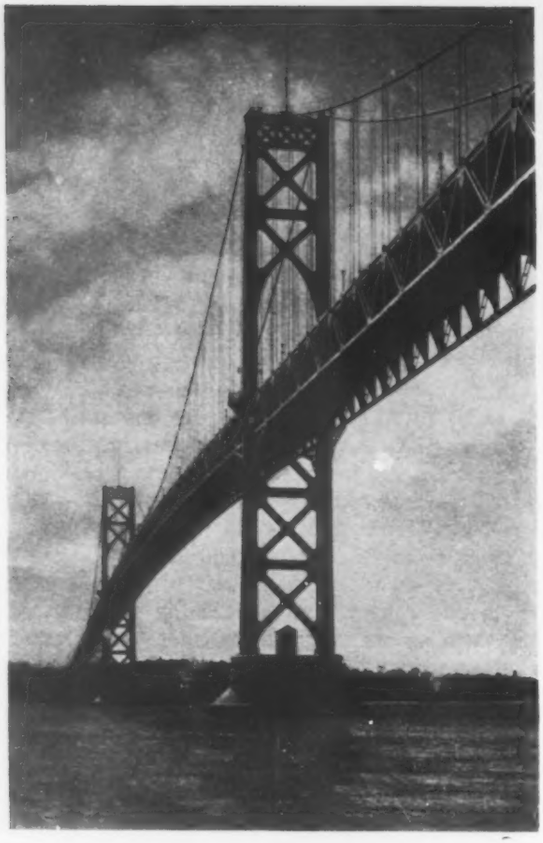
As the conveyor-propelled and now all but dismantled cars reach a station near the end of the salvage line, men with oxygen torches burn the motors loose from the frames. Overhead compressed air hoists are attached to the motors and they are swung to a washer. This bath of boiling water and soda ash expels them from the opposite end free from grease and dirt. Meanwhile, what is left of the cars continues on the conveyor into a 22-ton press, which crushes them as one would demolish so many match boxes. The remains are then transferred to the third conveyor, which carries them to the furnace doors.

(*Concluded on page* 60)



THE Old Cars Move Slowly Along on a Conveyor While Workmen Remove Tires, Glass, Roof Material, Spark Plugs and Other Parts

WHAT Is Left of the Car Is Crushed in a Press So That it Can Be Shoved into a Furnace for Remelting of the Steel. The picture shows a car that has just come out of the press and that is about to be transferred to another conveyor which will carry it to the furnace



Properties of High-Strength Structural Steels

STEEL in its various aspects again was the subject of much discussion at last week's meeting of the American Society for Testing Materials in Atlantic City, N. J. And, as befits a progressive group, the conferences centered upon applications of present-day importance, such as aircraft, big bridges, ships, pipe lines and heat and corrosion resistant equipment.

Standardization of Pipe

One of the most important activities in committee represents an attempt to draft schedules of wall thicknesses for all sizes of wrought pipe to suit different operating conditions. A formula has been proposed, and data concerning pressure ranges and operating conditions in various industries are being collected.

Other sub-groups are attempting to write specifications for several types of pipe for which no A.S.T.M. specifications are in existence, such as hammer-welded, fusion-welded, resistance-welded, lock-bar, and riveted pipe. Tentative specifications for the last three varieties have been prepared, but the sub-committee on steel tubing and pipe referred them back to the sub-groups for further consideration and to harmonize the differences of opinion held by prominent producing and consuming interests.

High-Strength Structural and Ship Steel

A great deal of work has been done in recent years looking toward the elimination of a multiplicity of specifications for structural and rivet steel for ships. These specifications have been sponsored by various bodies of steel producers, ship builders, insurance companies, and governmental bureaus. It was reported that one American standard is about to be written, satisfactory to most interested parties, wherein the ultimate strength will be raised from 60,000 to 72,000 lb. per sq. in. without sacrificing the full bend requirement for ductility.

Another sub-committee has made an exhaustive inquiry into the advisability of changing the tensile requirements of present structural steel grades to a higher range. It appears that a better move would be to write other specifications for higher strength structural steel of so-called medium grade, and this is in prospect.

Such steels are being used to a considerable extent both here and abroad, as was pointed out in a paper before the open session by E. E. Thum, associate editor, THE IRON AGE, on "The New Manganese Steels."* As a matter of fact, the ordinary structural steels now being rolled in America are quite safe to use under considerably higher stresses than the ones now permitted by most building codes. A well deoxidized structural steel containing at least 0.20 per cent carbon and 0.60 per cent manganese can be greatly improved in tensile properties by heat treatment; 0.30 carbon 1.25 manganese steel in normalized condition possesses a 45,000-lb. proportional limit, and has been used since the war by the British Navy. So-called structural silicon steels and medium manganese steels are also favored where even more enhanced properties are required, yet where the expense of the conventional 3.5-per cent nickel steel is not warranted. Data on such material are given in the table.

*Much of this information was printed in THE IRON AGE, March 21, 1929, page 797.

Medium-manganese steels also include an important and growing tonnage of steel rails. H. H. Morgan, manager, rail and fastenings department, R. W. Hunt Co., Chicago, warned against the idea that all steel troubles would be cured by boosting the manganese content. He called attention particularly to the fact that occasional heats of medium manganese rails (with both carbon and manganese near the upper specified limit) have possessed hard centers and have rapidly developed split heads in service. Under the microscope the deep-seated areas show sharp needles of martensite embedded in well developed pearlite—a rather unusual association. Prof. Bradley Stoughton also reported a coarse grain in medium manganese structural steels which he had examined.

Cold Drawn Bridge Wire

A group of data, unique in engineering literature, was presented by Leon S. Moisseiff, consulting engineer, New York, in his paper "Investigation of Cold Drawn Bridge Wire." The work was done on No. 6 galvanized wire taken from regular production, prior to shipment to Mount Hope and Ambassador bridges, and is representative of the 3700 tons of cable at present in these bridges, and which replaced the heat-treated wire first erected. Tests were made at Lehigh University, Bethlehem, Pa., under the direction of Professors W. A. Slater and Bradley Stoughton.

The steel was made in the acid open-hearth furnace; upper limit of carbon at 0.85 per cent was specified. Required physical properties of the galvanized wire were:

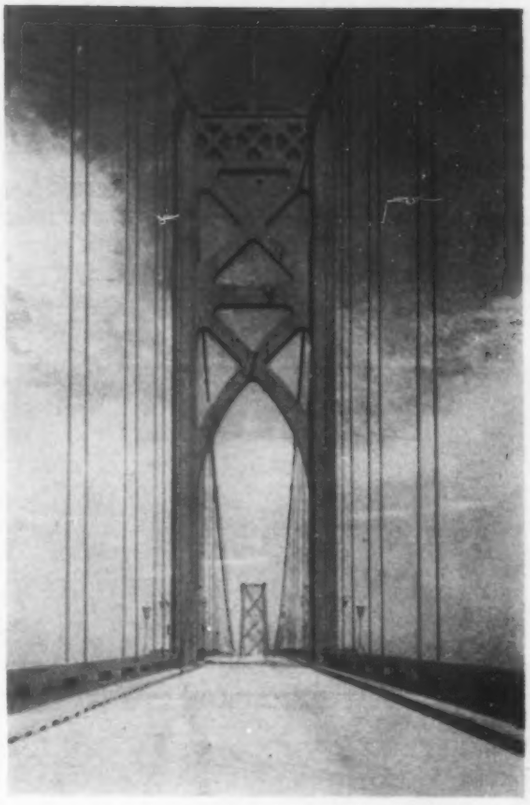
Tensile strength: More than 215,000 lb. per sq. in.
Yield point*: More than 144,000 lb. per sq. in.
Elongation in 10 in.: More than 4 per cent.

Of the 300 tests made in this special investigation, only four samples failed to show the required tensile strength; the lowest was 212,000 lb. per sq. in.

To determine the stress at which permanent elongation began, the stress was increased by steps and relieved. Averaging the results showed that the proportional limit and the load at first set are practically identical at 103,000 lb. per sq. in. This is well above the design stresses of modern suspension bridges.

An important series of long-time tests was performed. As shown in the view, a number of very simple lever machines were constructed in which quiescent tensile stresses could be imposed for indefinite periods of time. When stressed at loads of 74,000 and 93,000 lb. per sq. in. (lower than the proportional limit), a slow stretch was observed with an electric telemeter. The amount of this "creep," which occurred during the 24-hr. test, was small and varied so much that it is difficult to distinguish between creep and the instrumental errors. When the load was raised to 113,000 lb. per sq. in. (above the proportional limit), a fairly consistent elongation gradually took place for two or three weeks, but further time up to two months showed that stability had been reached under that load. The total creep, average of all conditions of test at 113,000 lb. per sq. in., was about 230 millionths of an inch per inch, and there is little difference whether the wire was tested straight or bent around a 19½-in. sheave (either in the same direction as the permanent set from coiling, or when bent back in the opposite direction).

*Elongation of 0.75 per cent; 10-in. gage length.



Beauty and Grace Characterize the Suspension Bridge Over Narragansett Bay, Mount Hope, Rhode Island

Various other tests were made of wires which had been dented as deeply as they might have been if they had violently struck the square edge of a structural steel shape, and of other wires which had been closed to a 5-in. radius and straightened, or which had been bent to various angles up to 10 deg. Denting reduced the tensile strength 3.6 per cent, but the other types of mishandling had such a slight effect on the strength as to be within the limit of accuracy of testing and uniformity of material. The same may be said of tensile tests of wires refrigerated with "dry ice" to about —70 deg. Fahr.

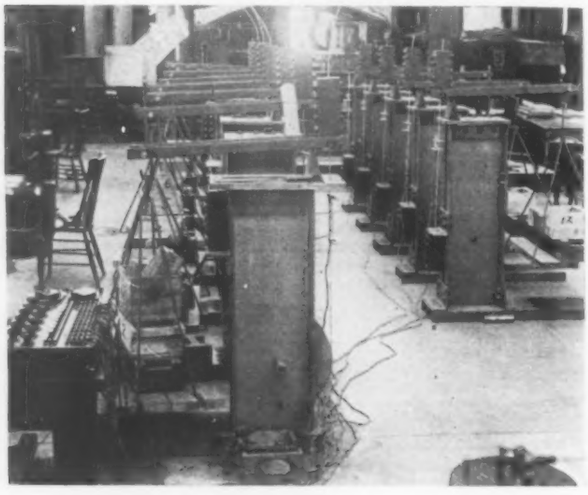
Merit Index for Engineering Steels

"The Relative Merits of Some Alloy Steels with Respect to Certain Mechanical Properties" was discussed in a paper by Bradley Stoughton and W. E. Harvey of the metallurgical faculty, Lehigh University, Bethlehem, Pa. It summarizes an enormous amount of arithmetical work, whereby about 50 alloy steels are appraised by means of eight merit indexes based on the tensile and impact properties. The results are susceptible of various interpretations, one of which is given by the authors, leading to the conclusion that nickel steel, chromium-nickel steel, chromium steel and chromium-vanadium steel are of highest utility, and in order of relative merit as stated.

H. J. French, International Nickel Co., New York, commenting on the paper, said that the classification

just given represents fairly well the appraisal of industry. Other critics took issue not only with the conclusions, but with the method and the fundamental thesis that such quality factors have any meaning, except when confined to steels designed for a particular service.

For instance, A. B. Kinzel, Carbide & Carbon Research Laboratories, Long Island City, N. Y., thought it was improper to compare test results taken on various sized specimens, to select optimum values rather than probable or minimum values, and to



Battery of Lever Machines for Making Long-Time Tension Tests on Bridge Wire. Elongations were measured by precision extensometers and electric telemeters

repeat a single analysis in a single table simply because data on more than one heat treatment were available. Jerome Strauss of Vanadium Corporation of America, Bridgeville, Pa., also believed that comparable data, properly weighted, are necessary to arrive at a reliable conclusion on merit or quality.

Speaking for the machine designer, J. M. Lessells, Westinghouse Electric & Mfg. Co., Pittsburgh, said that a ductile material should be differentiated from a brittle one—the latter class of material must frequently be absolutely excluded. Yet even the simple tensile test (which he regarded as approaching fundamentals much closer than the impact test) gives too little data on this, for no one knows where the danger line exists in ductility measurements, nor whether a good reduction of area is the chief criterion, irrespective of elongation. Similar thoughts were expressed by R. S. Johnston, research engineer, John A. Roebling's Sons Co., Trenton, N. J. Ability to accommodate local overstrains, he said, such as exist around rivet holes, is a fine quality possessed by cold-worked material, yet it is a quality which does not appear in the tensile or impact test.

Commercial Standard Adopted for Coloring Wooden Patterns

COLOR marking have been used for many years on foundry patterns to clarify, for the molder, the exact intention of the pattern maker with regard to the various parts of the pattern and the core box, according to the Bureau of Standards. In 1926 a standard color code for marking of foundry patterns was adopted by the American Foundrymen's Association in cooperation with a number of other national organizations.

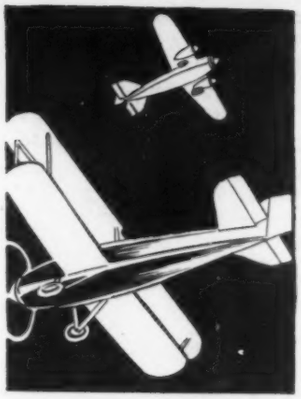
Several thousand copies of this color code were issued by the American Foundrymen's Association, although no direct effort was made to induce pattern manufacturers to accept the color code as a part of their regular practice until 1929 when the California Development Association requested the cooperation of the Bureau of Standards in establishing the system of color marking as a commercial standard. As a result of a wide circulation by the bureau, more than 450 firms and associations have indicated, in writing, that the system of color marking for foundry patterns and core boxes will be made a part of their regular practice.

According to this system, surfaces to be left unfinished are to be painted black; surfaces to be machined are to be painted red; seats of and for loose pieces are to be marked by red stripes on a yellow background; core prints and seats for loose core prints are to be painted yellow, while stop-offs are to be indicated by diagonal black stripes on a yellow base. Some variations in the shades of the colors are permitted. The colors may be obtained by mixing suitable inexpensive pigments with shellac or varnish so as to produce any type of coating material required for a given condition.

The standard became effective for new production Feb. 10, 1930. Those interested should write to the Superintendent of Documents, Government Printing Office, Washington, for Commercial Standard No. 19. The price is 10c. per copy.

Properties of Various Structural and Ship Steels

	29 American Structural Steels Not Responding to Heat Treatment	11 American Structural Steels Responding to Heat Treatment	Heat-Treated American Structural Steel	Heat-Treated Carbon Steel Used in Holt & Co. Ships	D-Quality for British Navy As Rolled	Structural Silicon Steel; Richmond Power Station	Medium Manganese Steel for Kill van Kull Arch
Chemical analysis:							
Carbon	0.12 to 0.32	0.16 to 0.23	0.21	.....	0.33	0.35	0.33
Manganese	0.34 to 0.64	0.51 to 0.77	0.64	.....	1.1 to 1.4	0.76	1.63
Silicon	.....	.....	0.14	.....	.....	0.27	0.18
Tensile properties:							
Ultimate strength	60,400	68,700	83,100	72,000	90,000	87,000	101,600
Yield point	40,300	47,800	66,500	.....	56,000	50,000	58,600
Elastic limit	.....	.....	.....	45,000	45,000	.....	.....
Elongation in 8 in.	25.9	25.2	18.5	25.0	17	21 (in 2 in.)	19.5



Aviation Materials—Reviewed in Broad Symposium

TO appreciate adequately the great variety and importance of the metals and other materials which go to make up the complex parts of aviation units, particularly airplane and airplane engines, one should carefully study the papers and discussions which made up the all-day program of the last two sessions of the annual convention of the American Society for Testing Materials at Atlantic City, last week. Friday, June 27, was devoted to a symposium on aircraft materials at which 18 papers were scheduled.

In all respects this symposium was one of signal merit. Coming almost on top of a similar symposium of 12 papers on materials for automobiles, by the same society in Detroit, March 20 (THE IRON AGE, March 27), too much praise cannot be voiced for the work accomplished by the society in bringing up to date the fast moving developments in these two industries—30 papers by authorities in these fields, published within three months is a signal accomplishment.

Last week's symposium covered practically all departments of the aviation industry. It was splendidly organized by a special committee, headed by Horace C. Knerr, consulting mechanical engineer and president, Metallurgical Laboratories, Inc., Philadelphia, and 15 other leading authorities.

Spread over two sessions, morning and afternoon, nine papers were grouped for the morning session, ably presided over by Mr. Knerr and nine for the afternoon session which was most efficiently handled by Prof. Bradley Stoughton, Lehigh University, Bethlehem, Pa. The excellent manner in which both sessions were conducted was a large factor in the success of the symposium.

Following a general introduction by Mr. Knerr, there were three papers on ferrous and non-ferrous metals for aircraft. These were followed by two on wood and textiles: "Strength and Characteristics of Wood Used in Aircraft Construction" by G. W. Trayer, service engineer, Forest Products Laboratory, Department of Agriculture, Madison, Wis., and "Aeronautical Textiles" by W. E. Emery, chief, division of fibrous and organic materials, Bureau of Standards.

Corrosion in aircraft was covered by a paper "Corrosion-Prevention Methods as Applied in Aircraft Construction" by Dr. H. S. Rawdon, chief, division of metallurgy, Bureau of Standards, Washington, followed by one on "Aircraft Finishes" by H. A. Gardner, director, Institute of Paint and Varnish Research, Washington. A paper on "Applications of Stampings, Forgings and Castings in Aircraft Construction" brought to a close the morning session. The author was H. G. Runde, chief of materials department, Curtiss Aeroplane & Motor Co., Garden City, N. Y.

Two papers on materials for aircraft engines opened the afternoon session, followed by two on testing aircraft materials in general: "Specifications and Materials Control" by H. A. Backus, quality supervisor, Metallurgical Laboratories, Inc., Philadelphia, and formerly materials specialist for the Curtiss Aeroplane & Motor Co., and the Berliner-Joyce Aircraft Corporation.

In the welding field two papers were scheduled, followed by one on "X-Ray Testing of Aircraft Materials" by Dr. Ancel St. John, consulting physicist, New York, with one on "Photo-Elastic Studies of Aircraft Parts" by T. H. Frost, assistant professor of physics, Massachusetts Institute of Technology, Cambridge, Mass. A fitting conclusion of the symposium was a paper "Heat Treatment of Aircraft Parts," by Horace C. Knerr.

It is possible in a report of this nature to review only a few of the chief features of some of the leading papers, leaving others for future issues of THE IRON AGE.

Scope of the Aircraft Industry

CHAIRMAN KNERR, in opening the symposium, read a brief introduction, touching on the scope of the aircraft industry. He said in part:

> A new industry is becoming established in America. Last year it represented a total investment of about $700,000,000. More than 6000 commercial and military planes, with a total value of over $44,000,000, were manufactured. Production of aircraft engines exceeded 7000 for the year, valued at $26,000,000. American airplanes in 1929 flew nearly 200,000,000 miles.
>
> Aircraft, including airplanes, seaplanes, flying boats, amphibians, airships and dirigibles, large and small, and recently gliders, are taking a place of rapidly increasing importance in our civilization.

Ships of the air are becoming indispensable in military service, mail, express and passenger transportation, agriculture, mapping, forest patrol and exploration, travel for business and pleasure and even in sports.

There is perhaps no industry in which an exact knowledge of the properties of materials of construction is more necessary. Each individual part must be completely dependable and yet must be reduced to the lowest possible weight. Factors of safety must be ample but factors of ignorance negligible. It is essential to know just what service each type and class of material can be depended upon to render and to insure that each unit and element will perform at par. This calls for accurate and complete engineering data, adequate and standardized specifications and rigorous and thorough testing to insure that requirements are met.

Metals Used in Airplanes

THREE papers introduced the symposium, all covering metals in airplane construction.

Many Ferrous Alloys in Use

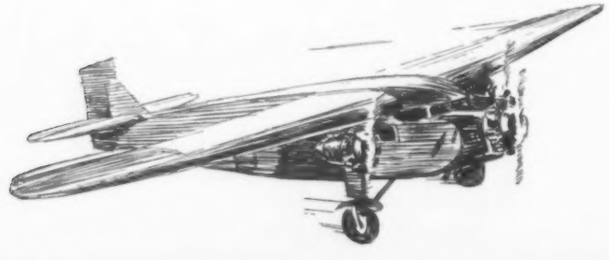
Ferrous metals used in airplane construction have nearly all been adopted from standards established for other types of automotive vehicles, said J. B. Johnson, chief, material section, material division, Air Corps, U. S. Army, Wright Field, Dayton, Ohio, in a paper, "Ferrous Metals Used in Airplane Construction." Such metals are divided into two classes: Cast and wrought.

The paper briefly covers the various types of ferrous metals which have become standardized, due to cooperation among the national engineering societies, Government bureaus and the industry, in attempting to limit the number of steels to a minimum. Tables give the chemical composition and physical properties of such steels and include cast ferrous metals; rods, bars and billets for drop forgings and machined parts; sheets and strips; and tubes.

Bars are specified hot rolled and annealed, or annealed with a bright finish, obtained by cold rolling or drawing. Hot-finished bars are generally used for drop forgings and parts which require considerable machining. Cold-finished bars are used for a large variety of special machined parts.

Rolled sheets for the more important and highly stressed members are extensively used by the airplane designer. Metallurgists have met the severe requirements by producing a sheet which will have equal tensile strength and bending properties, no matter what the angle of the axis of the specimen to the edges of the sheet.

Seamless cold-drawn tubes have afforded a means of obtaining economically, by means of simple welded joints, a structure which is rigid, resilient and of comparatively low weight. Tubing can be drawn to a wall thickness of 0.020 in. or even less, but ordinarily 0.028 in. is the minimum for control surfaces and 0.035 in. for fuselage. Minimum wall thickness depends on the diameter.



Most of the steels used as sheets, strips or tubes are alloy steels and they are carefully heat treated.

Many Light Alloys in Vogue

IN the field of light metals, alloys are limited at present to those whose chief constituent is aluminum or magnesium, said the authors of a paper "Structural and Engineering Light Alloys for Aircraft," by R. L. Templin, F. V. Hartman and E. C. Hartmann, aluminum research laboratories, Aluminum Co. of America, New Kensington, Pa. The authors give four tables covering the composition and heat treatment of aluminum cast and wrought alloys most frequently used.

Comparing light alloys and high-strength steel alloys, the authors find that for members in which tensile strength is of prime importance, the weight advantage is on the side of the light alloys, unless the steel used has a yield point of about 90,000 lb. per sq. in. Present tendency toward metal coverings, both in heavier-than-air and lighter-than-air craft, makes the light alloys indispensable. Up to the present time steel has been found too heavy to be used for covering material.

As to magnesium, the most common alloy used is designated alloy No. AM 7.4 containing approximately 7 per cent aluminum, 0.4 per cent manganese and 92.6 per cent magnesium. It is used in the cast or heat-treated condition for aircraft engine parts such as pumps, gear covers and even supercharger housings.

Large Use of Highly Alloyed Steels

A PAPER of outstanding merit was "The Highly Alloyed Steels in Aircraft Construction" by Jerome Strauss, chief research engineer, Vanadium Corporation of America, Bridgeville, Pa. Mr. Strauss reviews the latest products containing chromium or chromium and nickel or chromium, nickel and silicon. Their composition, heat treatment and applications are thoroughly discussed.

Duralumin Tubes Soon Available

Reference was made in the discussion which followed these three papers to the present status of duralumin tubing, sheets of which are so satisfactory. A representation of the Aluminum Co. of America stated that tubes have been made experimentally and commercial production is expected soon. Two processes are possible: Cupping or extrusion.

Responding to a question as to whether 50 or 60 per cent of the engine parts are of aluminum or its

H. C. Knerr

Bradley Stoughton

alloys, a metallurgist connected with a leading aircraft engine builder stated that 48 per cent is aluminum or magnesium alloys, 2 per cent bronzes or brasses with 50 per cent steels—all by weight. Magnesium alloys are being used more and more.

New Developments in Alloys

Another speaker offered some interesting testimony as to some new developments in alloys. Engine sleeves are being cast centrifugally of cast iron. In Germany and France, lithium and sodium are being added to silicon-aluminum alloys with excellent results. Fine properties are being obtained in Germany by adding beryllium to nickel alloys and in America some interesting results are being secured by using beryllium in certain alloys, iron in particular. He advocated serious attention to what is known as modified monel metal. Additions of 3 to 17 per cent aluminum in the United States and of 1.50 per cent in France result in tensile strengths up to 130,000 lb. per sq. in. with an elastic limit of 70,000 lb. including non-corrosive properties. The British are obtaining high tensile properties from swaged chrome-nickel steels containing about 3.50 per cent Cr and 1.45 per cent Ni—of value in certain airplane parts or as small pieces.

Alloy Springs Compared

Merits of silico-manganese and chrome-vanadium springs came in for some discussion. The former were described as extensively used abroad in preference to Cr-Va. One metallurgist said that carbon steel springs were favored as helical springs with the Cr-Va in flat springs. Also the Cr-Mo compositions are used in landing gears. Round wire springs of high elastic limit were described as containing 0.50 C; 2.0 Si; 1 Mn; 1 Mo; and 0.30 per cent Va.

Prof. H. F. Moore, University of Illinois, in discussing springs for airplanes said that two conditions had to be met: Rapid stresses, often repeated, and heavy stresses. For the former music wire springs are the best with Cr-Va ones valuable as valve springs. In the second case, as in landing gears, music wire springs are better because freer from inclusions. Drawing of the wire however is important.

Many Metals in Aircraft Engines

TWO papers, dealing with aircraft engines, made up this group of the symposium. One dealt with the materials which go into engines and the other with failures of such units.

Why Engines Fail

No little interest was manifested in the contribution on failures. Thomas T. Neill, assistant engineer, Bureau of Standards, Washington, in his paper "Failure of Aircraft Engine Parts and Causes Thereof," describes numerous failures in various parts of engines, subject to test, and explains the causes. The conclusions are based on data obtained during the two previous years of aircraft engine testing conducted by the Bureau for the aeronautic branch of the Department of Commerce.

The conclusion is that failures found in the valve assembly, pistons, connecting rods, crankshafts, bearings, gears, crankcases and cylinders, are due to lack of sufficient development work by the manufacturers.

Entire Field of Structural Alloys Involved

Only by a careful perusal of the original paper can one glean the valuable facts concerning the metals most commonly used in aircraft engine parts which R. R. Moore, chief metallurgist, Wright Aeronautical Corporation, Paterson, N. J., offers in his paper "Materials of Construction in Aircraft Engines." Physical properties and chemical analyses of the various steels, bronzes and brasses and light alloys are given, including their applications with the reasons for the specific uses in each case.

The two outstanding demands are lightness and reliability—qualities which oppose rather than assist each other. Metals employed, said Mr. Moore, represent such a great variety of types and forms that they cover practically the entire field of structural alloys.

Tool Marks and Failures

Commenting on the two papers, a metallurgist from the Bureau of Standards said that certain types of failures, illustrated by Mr. Neill in his paper, were undoubtedly due to sharp angles, inadequate fillets, reentrant angles and indentations due to stamping marks with tools. A representative of a large aircraft engine builder declared that too many consider cost instead of the careful finishing of parts and that tool marks and similar defects cause many failures.

Larger Use of Cr-Mo Steels

A question was raised as to why chrome-molybdenum axle shafts were not used more in aircraft; they are used widely in automobiles. A response by a metallurgist, connected with a large aircraft engine builder,

was to the effect that the Cr-Mo steels will be used more than they have been, in parts other than sheets and tubing. These steels have better elongation than some others now being used and can be heat-treated at a lower temperature, although they do decarburize under some conditions.

Welding a Large Factor in Airplanes

WELDING as applied to aircraft construction was covered by two papers, one dealing with procedure control in welding and the other with metal joints.

Three authors of a paper entitled "Procedure Control in Aircraft Welding," H. L. Wittemore, chief, engineering mechanics section, Bureau of Standards; John J. Crowe, engineer in charge, apparatus research and development department, Air Reduction Sales Co., New York; and H. H. Moss, engineer, development department, Linde Aircraft Products Co., New York, laid down a particularized and complete statement of what they regard as procedure control. According to the authors, procedure control depends on: First, specifications for the material and apparatus used; second, ability of the operator; third, technique used in each operation, and fourth, inspection of the finished product.

They describe aircraft welding, in particular, as an art in which human skill plays an important part and as one in which procedure control can be used to insure uniformly good quality. In an investigation on the strength of welded aircraft joints, made recently at the Bureau of Standards, all specimens were welded under a procedure control prepared by the American Bureau of Welding. Included in the control were specifications for the apparatus used; tests of the base metal and welding rod for physical properties of weldability, tests to determine the ability and skill of the welder and inspection of the welds. The quality of the work, as shown by the test results, was uniformly satisfactory. Procedure control, therefore, if adapted by the manufacturer to his specific requirements, will result in structures of consistently high quality by reducing the human element to the absolute minimum, according to the authors.

How Metal Joints Are Used

In the second paper on welding, entitled "Metal Joints in Aircraft Construction," the author, T. Watson Downes, metallurgist, United States Naval Aircraft Factory, Philadelphia, gives data on the tensile properties of oxyacetylene welds of chromium-molybdenum steel, known as S.A.E. No. 4130 X. Such welds are made with low-carbon welding rod and with parent metal, both as welded and after heat treatment. He also presents the results of recent tension tests of oxyhydrogen and electric spot welded joints of duralumin sheet before and after heat treatment. Numerous applications of welding for aircraft structures are discussed and the microstructure of welded chromium-molybdenum steel, including welded fittings, spot-welded stainless steel wing-rib and welded aluminum gasoline tank construction are given.

Practice in Using Duralumin Rivets

In the discussion that followed presentation of these two papers, a representative of the leading aluminum manufacturer stated that, in riveting duralumin, rivets of this metal are heated in a lead bath before they are driven. On the subject of soldering aluminum, another representative of the same company said that such procedure is not satisfactorily possible. Recent progress, however, in electric welding, both butt and arc welding, using either carbon or metallic electrodes, has been developed to successful use.

Preventing Hair Cracks in Tubing

The subject of the development of hair cracks in chromium-molybdenum tubing was brought up and testimony was offered that this could be largely prevented by steel-blasting the material before welding. Such procedure was pointed out as having obviated at least 90 per cent of such tendency to cracking. Another metallurgist stated that the direction of welding was an important factor; it is better to weld away from the edge instead of toward it. Further testimony indicated that material of higher physical properties tends to develop the most cracking, while another metallurgist recommended that the best procedure is to buy sheets unannealed, normalize them and then blast them before welding. In most cases trouble is due to the welding and not to the heat treatment, although air hardening is a factor.

Rate of Heat Treatment

THE symposium was brought to an appropriate conclusion by an excellent paper, "Heat Treatment of Aircraft Parts," by Horace C. Knerr. The paper covered briefly the purpose of heat treatment and the effects thereof upon the mechanical properties of metal; the metals treated; the advantages, from the standpoint of design, inspection, storage and processing, of standardizing upon a minimum variety of alloys of specified composition; processes of heat treatment for steels and aluminum alloys and the theory underlying them; the character of furnace equipment called for in the heat treatment of various types of aircraft and engine parts, means for control of furnace atmospheres and temperatures, quenching means, and the relation of these to the results obtained; metallurgical factors requiring technical direction and supervision, and precautions for insuring

(*Concluded on page* 60)

Heavy-Duty Millers Have Variable-Speed Drive

VARIABLE-SPEED drive which provides an infinite number of spindle speeds over a wide range is a feature of improved Nos. 1 and 2 heavy-duty milling machines brought out by the Kent-Owens Machine Co., Toledo, Ohio. This variable-speed drive is emphasized as adapting the machines for small-lot as well as large-lot production.

The Variable-Speed Drive, Controlled By a Handle at the Front, Provides an Infinite Number of Spindle Speeds Over a Wide Range. The machine may be shifted quickly from one job to another

The No. 1 machine has been increased in range, made more rigid and more convenient to operate. The longer head-slide increases the maximum distance from top of table to center of spindle to 16¼ in., and permits the spindle center to be brought down to the same height as the table top. The lengthened saddle makes the table slideway longer, improving its accuracy, life and ease of operation. The handles for locking the saddle to the knee and the knee to the column are of new design. The knee is now a box-type casting with solid top and closed front.

Working surface of the table of the No. 1 miller is 5 x 22 in. The head can be fed vertically 6½ in. by means of the hand lever. Cross saddle adjustment is 5 in. and table travel is 17 in. With a 1200-r.p.m. driving motor any spindle speed from 120 to 1200 r.p.m. can be obtained; this range is covered without steps and the exact speed best suited for the job may be selected.

The No. 2 miller now has an idler in the spindle drive; this keeps the belt under proper tension and assures ample pulling power for all positions of the head. The table is 28 in. long and 7 in. wide. Maximum distance from the spindle to the table is 17½ in. The head can be fed 6½ in. vertically by means of the hand lever. Cross saddle adjustment is 7 in. and the total table travel is 22 in. With a 1200-r.p.m. motor, spindle speeds range from 100 to 1200 r.p.m.

Arrangement of the variable-speed drive may be seen in the illustrations. The drive from the motor to the backshaft is through a combination flat and vee belt. This belt rides on its angular edges between two cone disks on the motor shaft and upon the inside face over a plain pulley on the backshaft. The cone disks on the motor shaft are continually pressed toward each other by a coil spring, thus forcing the belt to the greatest diameter. The heavy endless belt used is made of woven cord vulcanized in rubber.

To change speeds, the motor carrying the cone pulley is moved toward or away from the backshaft. As the motor approaches the backshaft and their center distance becomes less, the spring forces the vee belt toward the outer circumference of the cone, driving the spindle at a high speed. Moving the motor away from the backshaft causes the vee belt to ride upon a small diameter of the cone, thus decreasing the spindle speed. Spindle speed variation of 3 to 1 is obtained by this adjustment, and this is increased to 10 to 1 by interchanging the spindle and backshaft pulleys.

Speed changes are made at the front of the machine simply by turning the handle shown at the lower part of the guard.

Small Shop Microscope for Surface Conditions

FOR rapid examination and measurement of surface conditions the Bausch & Lomb Optical Co., Rochester, N. Y., has brought out a small but rugged shop microscope designated as the No. 32. The instrument is suitable for use on a bench or inspection table, and may be carried by salesmen for use in pointing out minute details of construction or perfections in finish which can not be seen by the unaided eye.

A scale in the eyepiece, calibrated in thousandths, which is 1/10-in. long, enables the operator to measure the crack, flaw or other characteristic under examination to determine its quality or adherence to precise specifications. With exact measurements of a thousandth of an inch made possible, a quarter of a thousandth is easily estimated.

The shop microscope magnifies forty times and has a field up to 7/32 in. It is self-illuminating. The instrument is 7¾ in. high and weighs only 1½ lb. It has a black enamel and chromium finish.

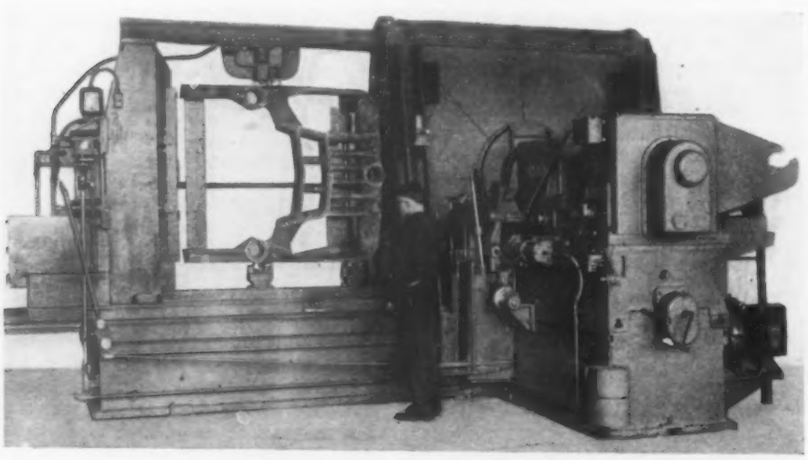
A Scale in the Eyepiece Permits Measuring the Crack or Other Flaw

More Boilers Ordered in May

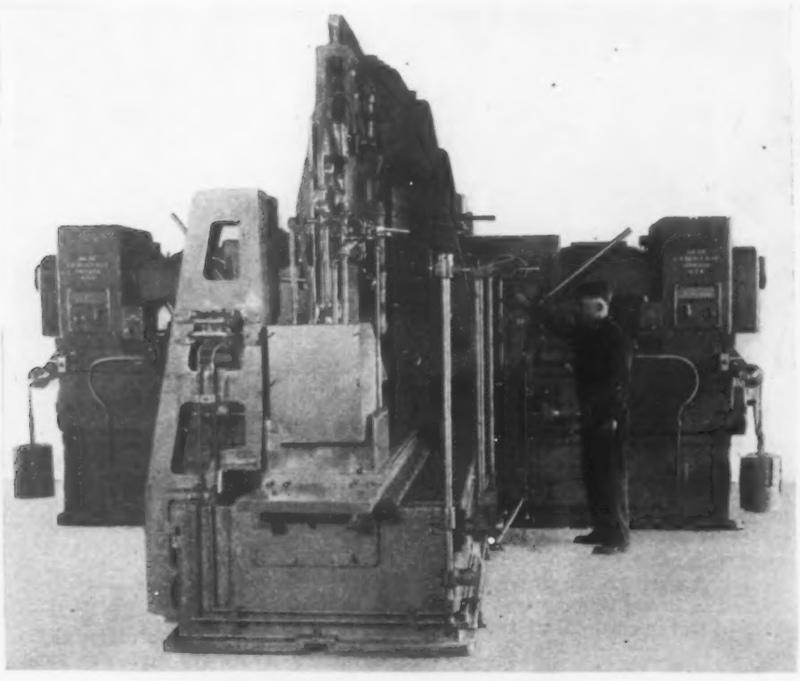
WASHINGTON, June 28.—Orders were placed in May for 1280 steel boilers with 1,326,490 sq. ft. of heating surface, against 1017 with 1,070,093 sq. ft. in April, according to the Department of Commerce. In the first five months of 1930 orders totaled 5089 boilers with 5,680,947 sq. ft., against 7040 with 7,921,053 sq. ft. in the like period of last year.

Special Grinder Employed on Heater Sections

TO produce flat surfaces on the sides of heater sections accurately and economically, the Spencer Heater Co., Williamsport, Pa., has installed the large double-spindle grinding machine illustrated.



Both Sides of Large Heater Sections Are Ground Flat and to Size Within 0.003 In. in 4 Min. The ball bearing table fixture is operated hydraulically, as is work clamping and drawing of the wheels apart to permit entrance of the work. The grinding wheels, mounted face to face, are 6 ft. in diameter



This machine built by Charles H. Besly & Co., Chicago, has two grinding wheels, 6 ft. in diameter, mounted face to face, so that both sides of the heater sections may be ground at the same time. The large traveling table fixture is mounted on ball bearings and is operated by means of a hydraulic system.

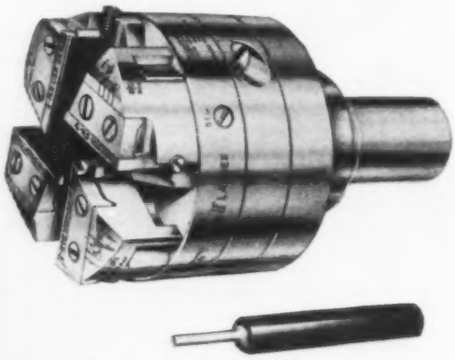
Heater sections are placed in the fixture at the loading position, at the front of the machine, and are clamped hydraulically. From the loading position the fixture travels at high rate and slows down automatically to grinding speed when it reaches the grinding position; it reverses automatically in this position. The grinding wheels are fed against the work by means of weights, and are sized by a positive micrometer arrangement. When the section is ground to size, the operator pulls a lever and the fixture, with the section, returns to the loading position and stops automatically. The grinding wheels are drawn apart to permit the work to enter, this being done hydraulically.

This machine finishes the sides of large heater sections flat and to size within 0.003 in. in 4 min. The large sections measure 56 x 65 in. and are 7 in. thick. Weighing approximately 1000 lb., they are transported to and from the grinder by means of a semi-automatic overhead conveying system. The operator loads and unloads these sections in 1 min.

Operating floor space occupied by the machine, which weighs approximately 35 tons, is 30 x 40 ft. The height of the machine is 10 ft. The two 6-ft. wheels are driven by two 50-hp. motors, and the hydraulic systems for operating the fixture and clamping devices are driven by 7½-hp. and 3-hp. motors. Lubrication of the entire machine is automatic. Grinding dust is removed by a powerful exhaust system that employs a 30-hp. motor. The grinding members are two 72-in. Besly Titan Steelbacs, 1 in. thick, bonded with Bakelite.

Internally-Tripped Die Head

AN internally-tripped die head named the Landex has been introduced by the Landis Machine Co., Waynesboro, Pa. The internal tripping attachment adapts the tool for close-to-shoulder threading of pieces varying in length and for work requiring uniform length of thread. It is particularly suitable for use where a fixed stop cannot be used to open the die head, or where the work is held loosely in a fixture, as on a drill press table.



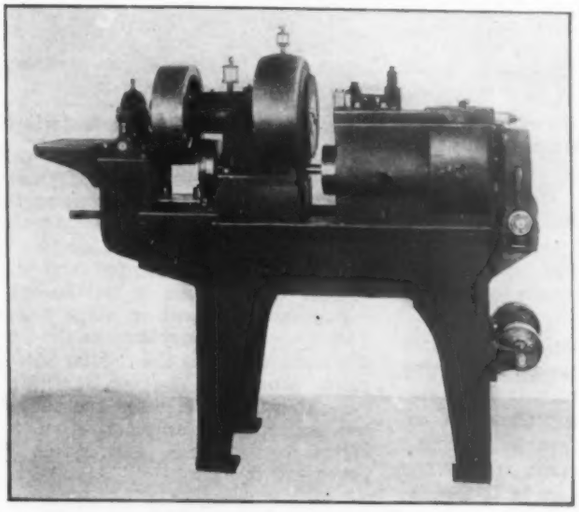
The Internal Tripping Device Adapts the Tool for Close-to-Shoulder Threading

The tripping mechanism consists of a plunger held in the shank of the head, the shank being drilled and tapped to accommodate it. The plunger is adjustable and can be set to any thread length within the capacity of the head. The head is positively tripped when the end of the work comes in contact with the tripping plunger; this, when the head is used on automatic screw machines, eliminates the necessity of accurate timing of the head-opening cam. When used on a drill press, this head eliminates the necessity of chucking, a socket or floating fixture being used to hold the work. The internally-tripped Landex head is made in sizes for threading from 3/16 to 2 in. in diameter.

May shipments of enameled sanitary ware totaled 242,382 pieces, against 243,986 pieces in April and 342,620 in May of last year.

Automatic Swaging Machine for Temple Butts

TEMPLE butts for use in the manufacture of eye-glasses are swaged automatically on the machine illustrated, which was built by the Langelier Mfg. Co., Providence, R. I. shaft being driven by a motor under the bed. The purpose of the two camshaft speeds is to actuate the wire draw-bar at slow feed while the wire is being swaged and at fast speed for the remainder of the cycle. This permits of larger output.



WIRE Taken From the Coil Is Straightened, Swagged and Cut to Length. The eye-glass parts are produced at the rate of 8 per min.

These butts range from 2 to 3 in. in length; the ends are 0.080 in. in diameter and the swaged section is 0.050 in. in diameter. The machine takes the wire from the coil, straightens it, then swages and cuts it to proper length. Eight temple butts are produced a minute.

Arrangement of the machine may be seen in the illustration. The No. 3 open-die swaging head employed is driven by belt from a motor under the machine. At the opposite end of the horizontal bed is bolted the mechanism for drawing the wire through the swaging dies and cutting it to length. A shaft carrying four cams is mounted in the skeleton frame of the machine. The first cam, directly under the swaging head, operates the wedge draw spindle in the swaging head, through a connecting cam roll bar and segment gear lever. The drum cam on the opposite end of the camshaft operates a draw-bar which slides in ways in the top of the skeleton frame. The draw-bar has a pair of gripping jaws in its front end for pulling the wire through the dies, these jaws being opened and closed by a cam.

The cut-off and wire-holding device bolted to the top of the skeleton frame can be adjusted to different positions to suit different lengths of temple butts. It is cam actuated. The draw-bar can be adjusted to different working positions.

The camshaft is driven by a worm and worm wheel through a pair of clutch pulleys that run loose on the worm shaft. A thimble between the two pulleys is actuated through a bell crank lever by a pair of dogs located in the worm wheel. The clutch pulleys on the worm shaft are driven by a two-speed jack-shaft that is bolted to the leg of the machine, the jack-

Press Brake Gages Have Micrometer Adjustment

UNIVERSAL gages with micrometer adjustment are now standard equipment on the press brakes built by the Cincinnati Shaper Co., Cincinnati.

These gages are adjustable and may be used either on the front or on the rear of the press. Horizontal gage rod *A* may be moved quicky to the approximate gaging position and clamped in place by cap screw *B*. Final adjustment is made with micrometer nut *C* and locknut *D*.

The gages can be set for forming wide or narrow sheets either upward or downward. They can also be used as an adjustable two-step gage for making both bends of a channel successively with only one handling of the sheet. Gage rod *A* may be replaced with any ½-in. diameter rod, which can be notched for a step gage or bent to any shape desired for gaging a special bend.

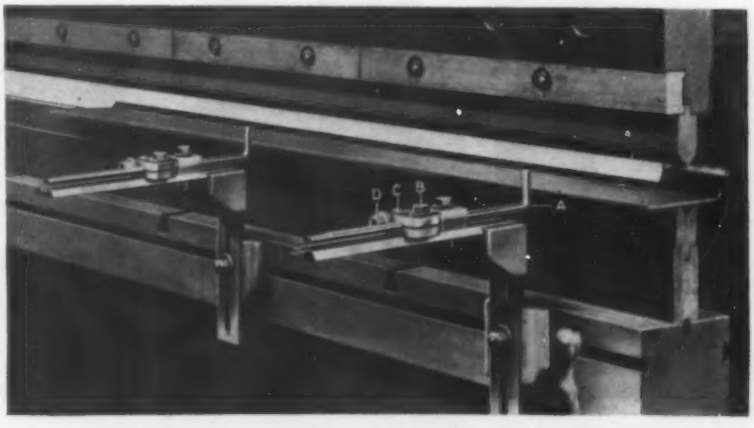
Four-Inch Pipe Reamer

THE Oster Mfg. Co., Cleveland, has placed on the market a 4-in. pipe reamer, which, although designed for use with its No. 414 Power Boy, is supplied with handles for hand operation.

A feature of the tool is the screw feed, the pressure exerted by the screw being said to eliminate entirely the necessity for pushing against the tool for a thorough reaming job. Three replaceable reaming blades are employed, and the body of the tool, which is designated as the No. 414 reamer, is made of malleable iron.

Although Designed for Use with the "Power Boy," the Handles Permit Manual Operation

General Fireproofing Co., Youngstown, has received contract from the United States Government to construct upright steel files for Federal Offices in Washington and throughout the country during the next year.



These Press Brake Gages Can Be Set for Forming Wide or Narrow Sheets Either Upward or Downward

Testing Society Holds One of Its Most Profitable Conventions

IN surroundings that were distinguished for their commodiousness and attractiveness, the American Society for Testing Materials held its thirty-third annual convention at Atlantic City, N. J., last week, June 23 to 27. Within the past year the new Haddon Hall unit of Chalfonte-Haddon Hall has been entirely completed, replacing the old historic structure. On the upper floors, unusual facilities for conventions have been provided. These were used by the society for the first time this year. Besides numerous small meeting rooms, there are two large auditoriums for the technical sessions. There are also several lounging rooms for the accommodation of those who want to hold interviews. Architecturally and in its furnishings the combined facilities are ideal.

Attendance at the convention was very large. Registration of men on each day surpassed that of corresponding days last year, the convention having been held in other quarters in the same hotel. The present business depression did not interfere with the enthusiasm of the members who are characterized, by some with authority to speak as the hardest working members af any technical society. On its 87 standing committees for specification making and for research there are about 2400 members who actively engage in this work, holding meetings at different intervals during the year. The week's work was one of the most gratifying in the society's history.

Total registration was close to 1100, which compares with 934 last year. There were about 260 ladies. In both cases, new attendance records were established.

Technical Sessions and Work of Committees

SOME idea of the scope of the convention and of the society's work can be derived from the fact that last week there were 16 technical sessions and 146 meetings of the various specification and research committees — most of them simultaneous with others each day and evening. There were seven sessions relating to steel, iron and metals, at each one of which excellent technical papers were presented, besides the regular committee reports.

Several important specifications, which have been tentative for a year or more, were advanced to standard by the action this year and some new tentative standards were placed in the record, as well as reviews of tentative and regular standards. These will be reviewed in a subsequent issue. It is the policy of the society through its committees to keep all its standards in step with progress in industry.

Latest Data on Aircraft Materials

The technical feature of the week was a symposium on aircraft materials, held during two sessions on the last day of the convention. At this 18 papers by leading authorities in each field were presented and discussed. Chief points in this splendid session are reviewed on other pages. This symposium supplements the similar one held during the regular spring group committee meeting at Detroit on March 20, 1930, when the subject was materials for automotive use, reviewed in THE IRON AGE, March 27, pages 930 to 932.

Technical Sessions on Metals

Among the sessions on metals mention should be made of those on steel, on fatigue and on non-ferrous subjects.

At the steel session were four outstanding papers on "The Relative Merits of Some Different Alloy Steels with Respect to Certain Mechanical Properties," by Prof. Bradley Stoughton and Wilber E. Harvey; on "Some Effects of Nickel Content in Austenitic Iron-Chromium-Nickel Alloys," by N. B. Pilling; on "Investigation of Cold-Drawn Bridge Wire," by L. S. Moisseiff; and on "The New Manganese Steels," by E. E. Thum.

New Data on Fatigue of Metals

Valuable contributions to the knowledge of fatigue of metals took up half of one session at which Prof.

NEW MEMBERS OF THE EXECUTIVE COMMITTEE

H. N. Van Deusen

Zay Jeffries

F. H. Jackson

G. A. Reinhardt

Little Expansion Seen in Near Future

BY LEWIS H. HANEY
Director, New York University Bureau of Business Research

COMPLETE data for May do not indicate any essential change in the position of the steel industry as regards the relationship between production and the requirements of consumers. Both declined more than usual for the season, but output continued out of line to such an extent that it must have been excessive.

Our index of the potential current requirements of the chief steel-consuming industries—the "composite demand line"—fell to the lowest point of the year. While not so low as in December, 1929, it was slightly under the March level. It is below the average for 1921-1927. The adjusted index of railroad freight tonnage increased a little in comparison with April, but all other factors pointed downward.

Automobile production was at the rate of 114 per cent of the 1921-1927 average, against 122 per cent in April. The mining and oil index was 97, against 100. Building contracts (floor space) were 72.6, against 74.6. General manufacturing, excluding steel and automobiles, was off a point, and machine tool orders declined sharply to the lowest level since late 1927. Exports of iron and steel were the lowest, considering the season, since June, 1926, though not much below December, 1927.

Must Adjust Production to Needs

Again, we conclude either that steel production must be curtailed further, or that the activity in steel-consuming industries must rise.

While one of the most hopeful business indications continues to be the evidence that *building activity* has reached bottom levels, there is little reason to expect any considerable expansion in the near future. It is still true that, however low New York call money may be, money for building purposes is not really easy. The bond market continues backward and real estate mortgage bonds are greatly depressed. New issues of long-term real estate bonds declined sharply in May. While, therefore, building permits have risen somewhat and an improvement in the bond market is only a question of a little time, several months must elapse before a pronounced upturn in building can be expected.

Railroad earnings in May showed a decline from last year of over 30 per cent in gross and over 13 per cent in net. Equipment orders have been steadily declining, freight car orders being the lowest for May since 1924. Locomotive unfilled orders are declining and have fallen below shipments—always an unfavorable indication.

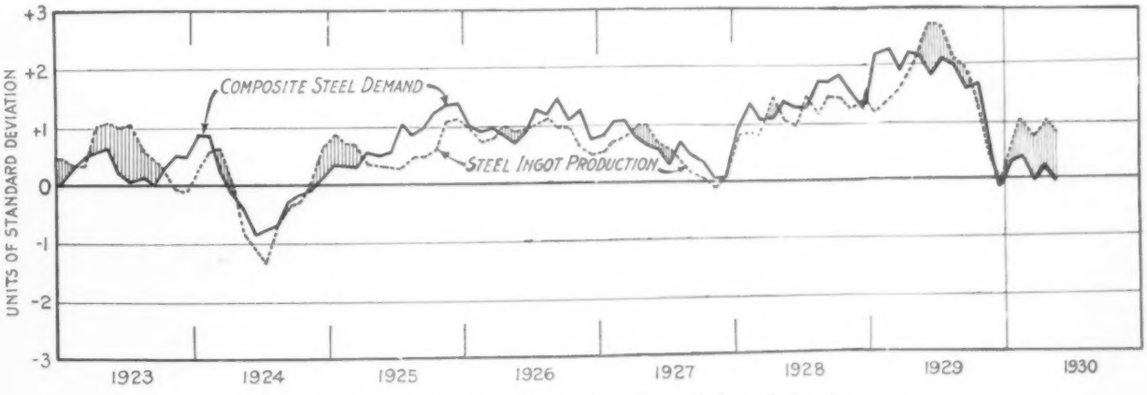
Over-Production of Automobiles

It is now pretty generally recognized that the more optimistic attitude of *automobile manufacturers* of a month or two ago was not warranted, and production is on the downgrade. Probably several manufacturers have over-produced. Automobile production this year has been abnormally high in comparison with building activity, a condition generally followed by a downward readjustment. Orders for malleable steel castings, considering the season, have declined for three months and are relatively low. Further recession in this industry is forecast.

The *mining* industries are depressed, from copper to coal. Domestic copper mine production is at the lowest level since early 1923. The *oil* industry is in an unfavorable position, as indicated by the highly competitive situation and low prices in the gasoline market.

Declining trends of machine tool orders and orders for commercial steel castings tell their story as to the outlook for *general manufacturing*. The export outlook continues highly unfavorable. It should be remembered that the P/V line is still below normal.

Just as it is foolish to fail to recognize that recovery from this depression is merely a matter of time, and but awaits the development of the usual processes in the business cycle, so it is not wise to shut one's eyes to the fact that a business depression now exists and will continue for some months.



Production Too High Above Demand to Foretell Any Quick Recovery

This Issue in Brief

Identifies different steels accurately by simple, revolutionary, new method. Specimen is held against grinding wheel. Pellets driven off are examined under microscope. Their physical appearance immediately identifies the steel.—Page 2.

* * *

Steel exports smallest in twenty-seven months. Total iron and steel shipped out of the country in May was 196,120 gross tons, a 25 per cent loss compared with April. Total for first five months is 21 per cent under same period of last year.—Page 65.

* * *

Inspectors get a bonus based on the number of defective castings they find. The bonus is not paid on all defectives; only on those that have passed the heavy discard, which occurs before sandblasting.—Page 5.

* * *

Ford's disassembly line for scrapping old cars is virtually the famous assembly line in reverse. Everything is segregated and saved. Even the grease is collected. Ford pays $20 for old cars, regardless of make or condition. Will soon start a second salvaging plant.—Page 14.

* * *

Denting affects wire strength very little. Tensile strength reduced but 3.6 per cent. Other types of mishandling had still less effect.—Page 17.

* * *

Avoids the needless expense involved in doing work on defective castings by inspecting before each major operation. Steel castings are given six rigid and searching inspections.—Page 7.

Heat treating will greatly improve tensile strength of structural steel, well de-oxidized and containing at least 0.20 per cent carbon and 0.60 per cent manganese.—Page 16.

* * *

Cutting tool record is maintained during experimental stage with tungsten-carbide tools. Each tool is given a serial number and a close check is kept on its performance. Those not proving economical are immediately investigated.—Page 11.

* * *

Boosting the manganese content won't cure all steel troubles, says engineer. Warns against hard centers in medium-manganese rails. Coarse grain in medium-manganese structural steels is also reported.—Page 16.

* * *

Failure of aircraft engines is frequently due to sharp angles, inadequate fillets, and indentations due to tool marks. Too many consider cost instead of careful finishing of parts, aircraft engine builder declares.—Page 19.

* * *

Hair cracks in tubing can be largely prevented by steel-blasting the material before welding. The direction of welding is also an important factor; it is better to weld away from the edge instead of toward it.—Page 19.

* * *

Piece work rates adjusted as use of tungsten-carbide cutting tools expands in Sellers plant. Tools of new material are carried in toolroom. Any operator can draw them upon authorization by his foreman.—Page 10.

Hand grinding of tungsten-carbide tools is usually expensive and unsatisfactory, machine tool builder finds. Sellers requires that all tools of the new material be machine-ground. Thus water can be used, and the operation speeded up.—Page 11.

* * *

Good-sized profits in careful scrap segregation, automotive industry finds. Motor car makers' annual output of scrap is about one million tons, survey reveals. Scrap is carefully segregated. Especial attention is paid to the separation of alloy steel scrap, both for higher price obtainable and for scrap analysis guarantee. —Page 66.

* * *

Weight advantage, in aircraft construction, is on the side of the light alloys, unless the steel used has a yield point of about 90,000 lb. per sq. in., say Aluminum Co. metallurgists.—Page 19.

* * *

In machining cast iron with tungsten-carbide cutting tools nothing is gained by lapping the tool after grinding. After cutting a very short time, a lapped tool has no better edge, even in finishing cuts, than a carefully ground tool that has not been lapped.—Page 12.

* * *

Tungsten-carbide tool breakage on intermittent cuts is caused by heavy feeds. Tools can be saved if the shock is reduced by lightening the feed until the cut becomes continuous. Feed should also be relieved when breaking through the end of a cut.—Page 13.

J. B. Kommers, University of Wisconsin, discussed "The Effect of Under-Stressing on Cast Iron and Open-Hearth Iron," with R. E. Peterson, and C. H. Jennings on "Fatigue Tests of Fillet Welds"; J. R. Townsend and C. H. Greenall on "Fatigue Studies of Telephone Cable Sheath Alloys"; N. L. Mochel on "A Note on Fatigue Tests of Nitrided Steels" and Dr. D. J. McAdam, Jr., on "The Influence of Stress Range and Cycle Frequency on Corrosion."

At a session on wrought iron, cast iron, magnetics and allied subjects, some high-grade contributions were offered either as regular papers or as appendices to committee reports. Among them should be mentioned a paper on "Investigation of the Effect of Phosphorus in Wrought Iron," by J. H. Higgins; "Effect of Section Size on Physical Properties of Cast Iron," by A. L. Boegehold, and "Comparison of Physical Properties of Different Sections of Cast Iron and of the Standard Arbitration Test Bar," by M. V. Healey.

At the seven technical sessions on metals there were 26 committee reports and 43 papers presented, including the 18 at the two sessions of the symposium.

Reviews of some of these and the non-ferrous session will appear in later issues of THE IRON AGE.

Executive Committee Reviews Society's Work

PROGRESS of the society is clearly reflected in the annual report of the executive committee, which this year contained 31 printed pages. Some of the important points follow:

Gain in Membership

Membership of the society shows a better net gain during the past year —111—than for several years. On June 1, 1930, the membership was 4355. It is believed that the period of transition following the increase of dues of company members has been passed and that a steady growth of membership will now be experienced.

Two new committees were organized during the year—one B-6 on die-cast metals and alloys, taking on the activities heretofore carried on by subcommittees of B-2 on non-ferrous metals. The other committee is on mortars for unit masonry.

Regular publications of the society for 1929 comprised 2659 pages besides the Book of Tentative Standards of 901 pages. Two publications this year of special interest are the 12 papers and discussions which made up the symposium on automotive materials at the society's first regional meeting in Detroit, March 20, to be issued as a special pamphlet.

Standards for Students

The other is a pamphlet entitled "Selected A.S.T.M. Standards for Students" in which has been collected a number of specifications and methods of test for use as a text or reference in the technical schools. In the few months since it has been issued this pamphlet has made a very definite appeal to the heads of engineering schools throughout the country and it has been necessary to print a second edition to meet requirements next fall. The pamphlet is sold to students at the price of 50 cents. A revised edition will be printed after the appearance of the 1930 Book of Standards in time for use in the colleges next year. The executive committee has concluded that this pamphlet will be an extremely useful publication to the student members of the society—possibly more so than the complete Book of Standards. It has accordingly decided to recommend to the society that the annual dues of student members be changed from $3 to $1.50 by amendment of Article VII, Section 1, of the by-laws, with the understanding that the pamphlet of selected standards instead of the book of standards will be supplied to student members.

Active Interest on Pacific Coast

Relationship to society work of members on the Pacific Coast has been studied during the year through discussions with the district committees of southern California, northern California and Seattle. A correspondent member of the committee on papers and publications has been appointed from each district and the three committees have been invited to review all phases of committee work of the society of interest to them and to make suggestions for appointments to standing committees. A plan of representation on committees of groups of members on the Coast interested in particular materials is being considered. Membership extension work has been assigned to the district committees.

Work of the committees of the society during the past year has been quite active and a review of this work, as pertains to standardization and research activities is now a stated function of committees E-10 on standards and E-9 on correlation of research, respectively. The annual reports of those two committees this year review these activities briefly and there will be issued next fall a more complete statement of the standardization and research activities of the society, including matters reported upon at this annual meeting.

A New Committee Organized

Since the last annual meeting, committee E-10 on standards has been organized. The steps leading to the creation of this committee were fully outlined in last year's report. The committee also acts in an advisory capacity to the executive committee in standardization activities in general.

The executive committee appointed the following members to the new committee: Cloyd M. Chapman, T G. Delbridge, J. H. Gibboney, E. F. Kenney and T. R. Lawson. Mr. Lawson was elected chairman and the secretary-treasurer serves ex-officio as secretary. The committee's first annual report shows substantial progress in taking hold of administrative problems in this field of the society's work.

Definite Policies Proclaimed

The executive committee has formulated certain policies to guide the society and its committees in matters relating to the approval and use of testing apparatus conforming to A.S.T.M. standards. At various times the society has been requested to give its formal approval to specific apparatus as conforming to the requirements of the society for such apparatus. In the opinion of the executive committee, it is not desirable that the society should exercise such a function. At the same time there

DUDLEY MEDALISTS

C. H. Davis

John R. Townsend

W. A. Straw

K. G. Mackenzie
New President

Cloyd M. Chapman
New Vice-President

T. D. Lynch
Retiring President

C. E. K. Mees
Marburg Lecturer

are often occasions where, through its appropriate committees, the society might well examine or advise on apparatus, and the society also desires to encourage in every way the development and marketing of testing apparatus that conforms to A.S.T.M. standards.

Accordingly certain policies were adopted after consultation with a number of leading apparatus manufacturers and dealers of testing apparatus which are published in the committee's report.

Relations with International Society

During the year the society has received very little information about the activities of the New International Association for Testing Materials, which it is presumed, however, are directed principally to the plans for the next international congress to be held in Zurich in 1931. W. H. Fulweiler, the society's representative on the permanent committee of the N.I.A.T.M., as reported a year ago, arranged for the preparation of 18 preliminary reports by especially qualified members of the society, upon topics that the society would be interested to see included in the program of the next congress, and these reports were forwarded to the officers of the international association and to the chairmen of the four sections under which its activities are being developed.

On June 1, 1930, there were 265 members of the society who were members of the international association, 47 being company and 218 individual members.

Retiring President's Address

AT a special general session, held Wednesday evening, June 25, the annual report of the executive committee, reviewed above, was presented by C. L. Warwick, secretary-treasurer of the society. This was followed by the annual address of the retiring president, T. D. Lynch, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Besides a review of some of the salient features of the society's work, past and present, Mr. Lynch emphasized in general the increasing need of new materials as industry advances and of adequate methods of testing these.

Next Year's Officers

FOLLOWING Mr. Lynch's address the election of new officers for the coming year were announced by the tellers. Formal introduction of the new members of the executive committee, the new vice-president, Cloyd M. Chapman, and the new president, K. G. Mackenzie, consulting chemist, the Texas Co., New York, who acknowledged the honor in an appropriate speech. It is the society's custom to recognize in its new officers the many phases of industry which its activities cover and this year the oil industry comes to the fore.

OFFICERS FOR 1930-31

President: K. G. Mackenzie, consulting chemist, Texas Co., New York.

Vice-president: Cloyd M. Chapman, consulting engineer, New York.

New Members of Executive Committee:

F. H. Jackson, senior engineer of tests, United States Bureau of Public Roads, Washington.

Zay Jeffries, consulting metallurgist, Aluminum Co. of America, Cleveland.

H. H. Quimby, consulting bridge engineer, Philadelphia.

G. A. Reinhardt, director of metallurgy and research, Youngstown Sheet & Tube Co., Youngstown.

H. N. Van Deusen, materials engineer, Bell Telephone Laboratories, New York.

Each year in the last four, due to the establishing of an adequate fund, some authority in a definite industrial activity delivered a lecture, known as the Edgar Marburg memorial lecture, in commemoration of the society's first secretary.

Memorial Lecture and Medals

THIS year this was delivered by Dr. C. E. K. Mees, director of research and development of the Eastman Kodak Co., Rochester, N. Y., who took as his subject "Color and Its Measurement." The lecture was a highly interesting exposition of the theory of colors and their mixtures, illustrated on the screen by means of special apparatus and the use of prisms.

Following this came the presentation of the Charles B. Dudley medal, bestowed each year on the author or authors of the paper of highest merit presented at the annual convention the previous year. The committee of award chose the paper, "Physical Properties and Methods of Test for Some Sheet Non-Ferrous Metals" by J. R. Townsend, Bell Telephone Laboratories, New York; W. A. Straw, Western Electric Co., Chicago, and C. H. Davis, American Brass Co., Waterbury, Conn. To the presentation of the medals by President T. D. Lynch, Mr. Straw responded in an appropriate speech.

Next Year's Convention in Chicago

For some years there has been considerable agitation for an annual meeting, periodically at least, in some Central Western locality. Three years ago, at the celebration of the society's 25th anniversary, the convention was held at French Lick Springs, Ind. Next year another trial of this plan will be made. The 1931 convention will assemble in June at the Hotel Stevens in Chicago, with definite dates to be announced later. It is not at all improbable that a regional meeting in connection with the usual group committee meeting will be held next spring in some Eastern city.

Steel Casting Interests Move to Improve Status of Industry

STEEL castings interests held a stimulating convention at White Sulphur Springs, W. Va., June 26, 27 and 28. It was the midsummer session of the Steel Founders' Society of America, Inc. It served to crystallize the developments of the organization during the past eight months in which the society has been operating under a new plan and under the direction of Granville P. Rogers as managing director.

An enumeration of the things being done by the society is impressive. Included may be mentioned these:

A monthly comparison is prepared of detailed departmental operating costs, to enable members to overcome inefficiency or wasteful methods in departments having high operating costs.

A monthly comparison of operating costs, expressed as percentages of sales showing spread for overhead and profit, thus to enable executives to detect shrinking percentage for profit and compare their showing with records of similar foundries.

Reports issued daily, listing current quotations on raw materials, as reported by member companies.

Monthly compilation of reports from individual members giving price trends on raw materials, labor situation, outlook for future business, reports on bookings, production, etc. These are discussed at monthly meetings.

Monthly tabulations in percentage of capacity for reporting members to give a further gage of market conditions. Foundries thus are relieved of the necessity of reporting these data to the Department of Commerce.

The society operates an employment and placement bureau for metallurgists, engineers, superintendents, salesmen, etc.

A cost committee, W. J. Corbett, Fort Pitt Steel Casting Co., McKeesport, Pa., chairman, has been working on a revision of the present standard cost formula as developed previously by the society, bringing it up to date to meet modern conditions.

An industrial research committee, Harold S. Falk, Falk Corporation, Milwaukee, chairman, has developed a set of standard trade customs, defining the conditions under which steel castings are bought and sold. These include a standard sales contract, order acceptance and standard quotation form.

At the beginning of operations under the present plan the association had 48 members. Since then 22 new members have been added. Considerable satisfaction was shown in the fact that in the face of the expanding and added activities, there was available on June 1 for operating purposes the sum of $31,989, or only $11 less than the amount eight months previous.

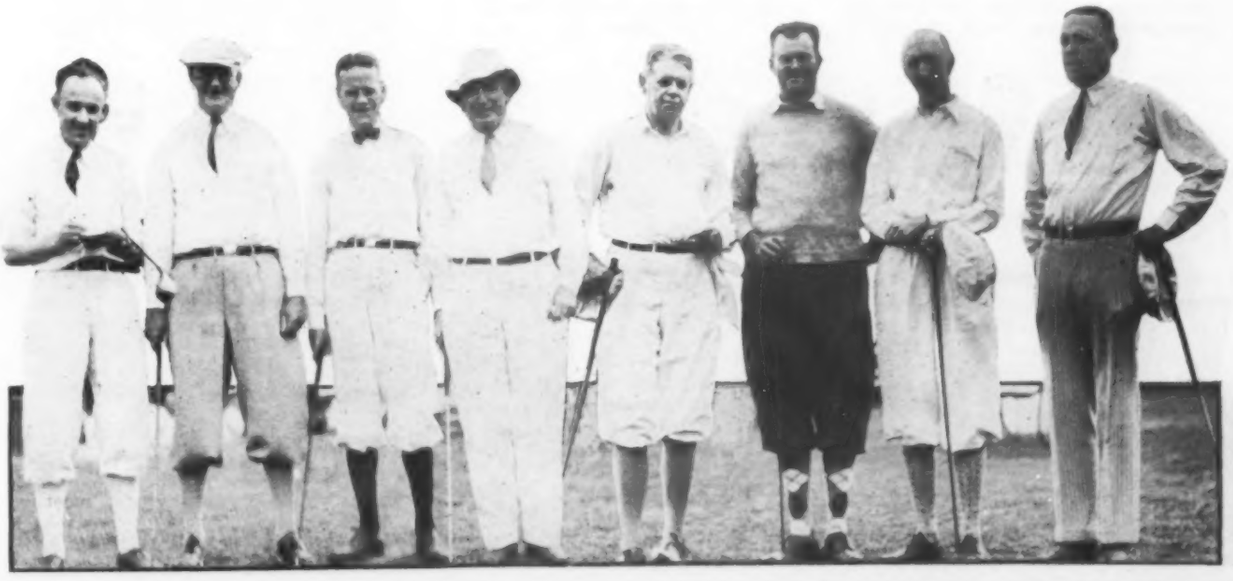
▲ ▲ ▲

F. J. Stanley, Michigan Casting Co., Detroit; H. C. Cunningham, Crucible Steel Castings Co., Lansdowne, Pa.; G. R. Casey, Treadwell Engineering Co., Easton, Pa.; Clarence Tolan, Jr., Dodge Steel Co., Philadelphia; H. E. Field, Wheeling Mold & Foundry Co.; D. C. Bakewell, Duquesne Steel Foundry Co., Pittsburgh; S. T. McCall, American Manganese Steel Co., Chicago; T. H. Harvey, Ohio Steel Foundry Co., Lima, Ohio

At the Saturday morning session, given over to the small castings group, the suggestion of the session chairman, Clarence Tolan, Dodge Steel Co., Philadelphia, was adopted, sanctioning the appointment of committees to meet for the specific purpose of analyzing the field for new uses of steel castings. W. H. Worrilow, president, Lebanon Steel Foundry, Lebanon, Pa., agreed to head such a committee in the East, to meet some time in the near future in Philadelphia for, say, a day or two. W. H. Gilmore, Ohio Steel Foundry Co., Lima, Ohio, was asked to establish a similar committee of five for his general district. Similarly a committee was suggested for the Michigan district.

The state of business, according to a survey of individual company reports, showed in general that bookings were fair, with a slight falling off since June 1. The expressions of opinion with respect to the future were in general optimistic rather than otherwise. Two or three recounted facts and developments in other fields that were taken to indicate the imminence of a turn in the business tide. The betterment these observers looked for was nothing more than a gradual but none the less healthy one.

Bookings were reported coming in at a rate of 70 to 79 per cent of capacity for one-fourth of the industry, at 50 to 59 per cent for about one-fifth of the industry, below 50 per cent for another fifth and at 60 to 69



per cent for perhaps 15 per cent. About 55 per cent of the total capacity of the companies in the society showed a decrease in inquiries, 20 per cent an increase, while the remainder designated the inquiries as steady. Weakness in scrap and steadiness in pig iron was the majority experience in respect to the raw material situation.

John E. McCauley, vice-president and general manager of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., conducted the general sessions. Addresses were made by Dr. Hugh P. Baker, of the Chamber of Commerce of the United States; Roger L. Wensley, president, G. M. Basford Co., industrial advertising specialists, New York; J. Noble Braden, secretary, arbitration committee, American Arbitration Association, New York; Charles F. Abbott, executive director, American Institute of Steel Construction, New York; E. St. Elmo Lewis, counsel in trade and consumer relations, Detroit; W. H. Worrilow, Lebanon Steel Foundry, and Frederick A. Melmoth, metallurgist, Detroit Steel Casting Co., Detroit. Mr. Worrilow devoted himself to selling problems, Mr. Melmoth's paper was entitled "Steel Casting Complexities," while the others covered the problems and possibilities of the trade association.

Arthur Simonson, Falk Corporation, Milwaukee; Granville P. Rogers, managing director, Steel Founders' Society; J. O. Horning, Mesta Machine Co., Pittsburgh; R. C. Brooke, Birdsboro Steel Foundry & Machine Co.; W. B. Sullivan, Michiana Products Corporation, Michigan City, Ind.; Ralph West, West Steel Castings Co., Cleveland; David Evans, Chicago Steel Foundry Co.; H. Tielke, Crucible Steel Castings Co., Cleveland

▼ ▼ ▼

In respect to the number of concrete suggestions capable of being carried back to the individual's business and

▲ ▲ ▲

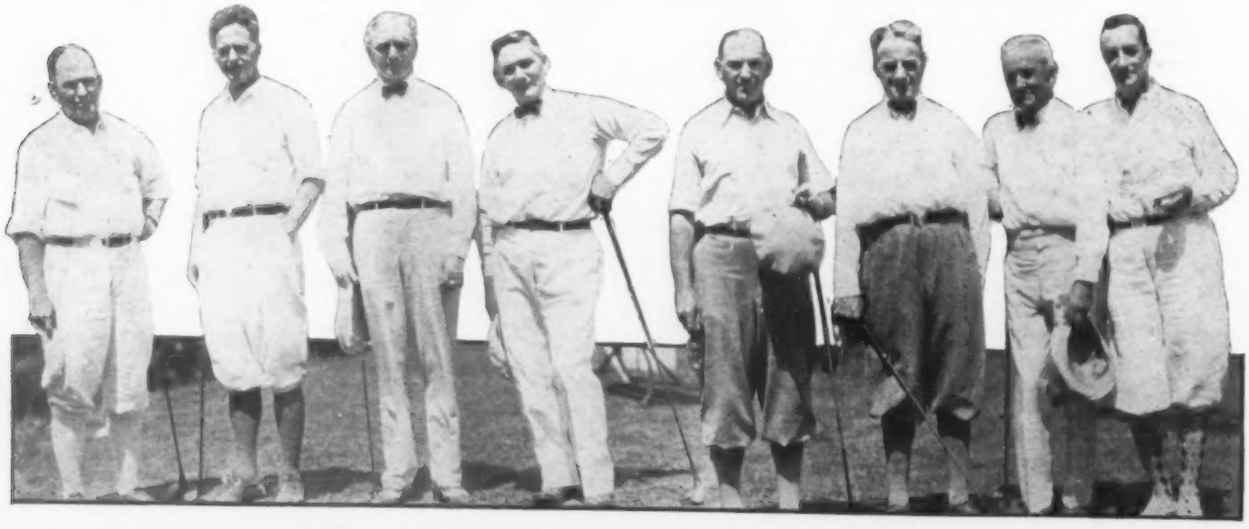
J. T. Osler, Hubbard Steel Foundry Co., East Chicago, Ind.; William A. Faison, Atlantic Steel Castings Co., Chester, Pa., J. E. Galvin and W. J. Gilmore, Ohio Steel Foundry Co., Lima, Ohio; George W. Balkwill, Cleveland Steel Castings Co., Cleveland; Thomas Drever, assistant to the president, American Steel Foundries, Chicago; W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.; J. E. McCauley, Birdsboro Steel Foundry & Machine Co,. Birdsboro, Pa.

applied with one modification or another, the addresses were unusual.

Managing Director Rogers, in his address, stressed the need of getting many more of the steel foundries not yet affiliated into the organization, not merely to maintain the pace of the past several months but to increase it. He dwelt also on the broad problems of a given industry in holding its position in the scheme of things.

"The first necessity of modern industry," said he, "is an understanding of its own problems. The second is an understanding of the problems of other industries and the underlying relationships which bind all industry together. The mere fact that industry is no longer self-contained impels us to contact with our neighbors as a sheer matter of business. As research and engineering skill break down the walls which have segregated us in the past, we find new alliances growing up, new areas of mutual self-interest. Out of these shifts is born the new cooperation."

Mr. Rogers also took occasion to recount the numerous activities of the society, some of which have been mentioned earlier in this account. For example, the society operates a material exchange; this allows a member to dispose of material at a fair price that he may have on hand but has no



immediate use for, although possibly of value to another.

National Business Guiding Council

Early in his address on the value of the trade association, Dr. Baker, Chamber of Commerce of the United States, expressed the hope that the business survey conference which came into being last December in Washington could develop into a continuing agency for the collection and dissemination of facts of industry. The business survey conference, it

S. W. Utley, Detroit Steel Casting Co., Detroit; R. A. Cannon, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; E. A. Balsley, recently resigned from the Wheeling Mold & Foundry Co., Wheeling, W. Va.; B. Fleeger, Oklahoma Steel Castings Co., Tulsa, Okla.

will be recalled, grew out of the several industries meetings called by the President after the stock market collapse of 1929.

Mr. Abbott, in his address, also discussed the need of some national business guiding institution, and Mr. Rogers quoted utterances of Mr. Abbott in this regard in his report to the society. Mr. Abbott holds that in the light of the seriousness of the widely inadequate return on business operations "public interest should command the appointment of a council or commission to consist of representatives of finance, labor, industry and economists that would give intensive study to the situation and develop the real causes through fact-finding, and then publish them as a semi-official indorsement which could be received by the public as the result of an impartial study of competent men, able and capable of determining causes."

What the Association May Do

As to the trade association, Dr. Baker dwelt in part on things which the association cannot do, such as discussing prices, the restriction of output or the allocation of territory. He stressed the value of establishing a system of supplying credit information, though, of course, the association can hardly distribute black or even white lists. The biggest thing an association can do, he said, is to collect facts. While the officials cannot be allowed to interpret them, there is actually no need of such, as the members can recognize the import of the facts, so long as they are dependable.

He emphasized as among the allowable and desirable things an association may do a comparing of costs and an effort to secure recognition of every factor entering costs. He touched on simplification and standardization, not so much in respect to the product of the member companies as in the equipment, for example, of the members' plants, to prevent, say, the retention of obsolete machinery.

Steel Castings Industry Needs Trading Up

Mr. Wensley's message was to let research and development bring cast steel in step with the new needs of industry. Then vigorously merchandise modern cast steel to all industry and win for it the broader usefulness it properly deserves.

"But the average engineer when he thinks of cast steel," said he, "still thinks of material that is not essentially as sound as the rolled or forged product. This point of view must be corrected for the good of the industry." On the other hand, he admitted, the engineer expects the steel foundry to cast steel in any shape and sends the foundry a pattern constructed without regard for the soundness of the finished product from a foundry viewpoint.

The foundry, he added, by personal effort should educate its customers as to what constitutes sound casting design and attempt to maintain such a close and confidential relationship with its customers that its advice will be encouraged when new parts are on the drawing board. Mass educational effort can also point out to the buyer of steel castings some of the pit-falls to avoid when designing a part to be cast in steel.

Cites Policy of S K F Industries

To illustrate the value of the trading-up principle, he told of the experiences of S K F Industries, maker of anti-friction bearings. "It was decided to make an advantage of a competitive weakness and sell S K F as 'the highest priced bearing in the world.' Advertising traded up the S K F bearing, and because in so many things price has become our measure of quality, S K F quality gained a wide-spread acceptance among manufacturers. This trading up of S K F gave the manufacturers using S K F bearings in their machinery an opportunity to say to their trade that in the bearings, those vital machine parts, no expense had been spared to supply the finest in the world. Along with the idea of high price S K F also emphasized the importance of a bearing and the costliness of skimping where a cheap bearing might do untold damage. By combining these two thoughts and selling them jointly to the trade, S K F lessened the effect of price competition and strengthened its position."

Securing the Fringe Market

As one source of new business in steel castings, Mr. Wensley discussed the "fringe" market, the no man's land between the zone in which cast steel is supreme to the zone where competitive classes of material flourish. The mass education effort necessary can be done, he said, most economically and most quickly through the medium of the trade press.

Among the elemental advantages of cast steel that could be stressed in the cooperative advertising effort are:

1. The elimination of maintenance and "out-of-service" losses resulting from the use of cast steel in place of built-up construction.
2. The *Modern* Cast Steel can reduce machining costs.
3. *Modern* Cast Steel may reduce assembly costs by casting in a single piece a part that was formerly assembled from many different elements.

Concrete Results of Research

The address of Charles F. Abbott, American Institute of Steel Construction, enumerated some of the questions that may receive attention by a trade association, discussed the place of the small industrial company and,

as already mentioned, advocated a business economic council as a national fact-finding body for the guidance of industry. Among the questions on which action has been taken by his own association are these:

Standardization and Simplification.
Codes of Trade Practice.
Code of Standard Practice.
Standard Specification.
Educational Meetings.
Standard Handbook.
Cooperative Advertising.
Research.
Uniform Cost System.
Sales Training.

As a result of research, he pointed out, the American Institute of Steel Construction has developed the battledeck steel plate floor construction, the use of steel in residences, and is furthering a program to develop the practical use of steel in dams, and in other large potential markets.

Small Companies are Missionaries

There is a failure in some industries on the part of some to recognize fully the economic position of the small plant or customer. "In the steel industry," said he, "the mills should not overlook the fact that the small concerns are the missionaries working the highways and byways, developing new customers for steel products, educating and promoting a steel consciousness. It is these small concerns that solicit the small orders, but in the aggregate they represent a large and important volume. The larger unit is not equipped mentally or in any other way to extend service to these smaller users, therefore reliance must be placed upon the smaller organizations.

"In some of the distributing industries there is a tendency on the part of some of the larger concerns to look with disfavor upon the small competitor. Trade organizations have taught them that extermination does not pay. They might be successful in exterminating one group today, only to find another crop tomorrow, less controllable and less subject to education."

Users Do Most of the Advertising

Mr. Abbott touched on advertising and association assessments. "There are many available records of success in advertising highly technical products, and the list is a long one. Steel in buildings, bridges, refrigerators, automobiles, railway cars, furniture, ball bearings, and other uses are all included in the list. The regrettable part is that the user, not the producer, of steel is doing most of the advertising for the steel industry. These constructors recognize the value of emphasizing steel as an important sales argument."

In the matter of organization assessments, Mr. Abbott charges that too many look upon them as items of expense. They should be considered, he urged, as items of cost and included in the sales price. "What difference does it make whether the assessments amount to 20c. or 50c. per ton, as long as all pay on a proportionate basis? In any event, 20c. or even 50c. per ton is seldom a competitive factor one way or the other, and the company that refuses to pay loses far more than it gains."

Trade Associations to Be Super Organizations

E. St. Elmo Lewis said he has acted as counsel to over 150 trade associations, organized 14 and set up plans, wholly or in part for 32. It seems strange that, in these days of 3000 trade and industrial associations, with over 400,000 members, there should be any need to seek members among the industry. Some day we shall exercise the discretion of the guilds and men will be proud of their trade associations and make it more difficult to belong. Trade associations in that day will be the super business organization of a trade.

There are 110 things you can do in sales management that will determine profit or loss of sales. There are 89 things a salesman can do right or wrong and put his selling average up or down and thus help make a profit or a loss. There are 71 important fundamental errors possible in an advertising campaign and the majority of the campaigns violate 30 to 50 per cent of them. There are 18 tests every piece of advertising copy should meet but only one advertiser in 34 will take the time to use them—and he is qualified in but one case in 9 to apply the tests.

In those statements lies the reason why so much of our sales expense is wasted and it costs so much to sell goods. Fundamentally our sales practice is where it was when John H. Patterson discovered and applied the job analysis idea to the salesman's job in 1900. The Patterson formula in part is: Know what he should sell and where it can be sold. Know what his territory should produce in sales and hold him to it. For one thing we shall get a line of our sales costs, breaking them down into functional costs and into lines of product.

Compiles Standard Trade Customs

The work of the association in developing a set of standard trade customs was discussed in a report made by the industrial research committee. The committee is composed of Harold S. Falk, Falk Corporation, Milwaukee, chairman, Frank D. Glosser, Commercial Steel Casting Co., Marion, Ohio, and Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Included are a recommended form of sales contract and an acceptance of orders and quotation sheet. These, it was emphasized, cover only those practices that have come to be generally recognized as standard and in common use by most steel foundries. The new code, it is held, makes easier the transaction of business because there will be complete uniformity in all matters pertaining to common conditions of sale.

The Steel Founders Society has published a booklet containing the new code and illustrating the standard forms. Any one desiring a copy should address the society at 932 Graybar Building, 420 Lexington Avenue, New York.

The statistical committee reported respecting the statistics which were compiled in the 1930 directory of steel and alloy foundries, issued by the society. These include production and capacity by processes, sizes and kinds of furnaces used, number of employees and tonnage of different kinds of castings made last year, such as the amount of heat and corrosion resistant castings.

Sharp Fall in June Iron Output

Daily Rate Down 6 Per Cent to 97,830 Tons—Net Loss of 19 Furnaces

ACCORDING to returns gathered by wire on Tuesday, July 1, from every active blast furnace except two (combined monthly output about 8500 tons) the June production, estimated for the last day or two in most cases, fell off precipitately from May.

Estimated daily output in June was 97,830 gross tons as compared with 104,283 tons per day in May, a loss of 6453 tons or 6.2 per cent. The June total for 30 days was 2,934,900 tons as compared with 3,232,760 tons for 31 days in May. The table below gives the totals for the last four months. The June daily rate is the smallest since January, when it was 91,209 tons. A year ago the daily rate for June was 123,908 tons.

Preliminary returns indicate that 20 furnaces were blown out and only one blown in—a net loss of 19. This is the largest loss since last December when 20 were blown out and none blown in. In May the net loss was only three furnaces.

Actual data will be published in THE IRON AGE for July 10.

Pig Iron Production by Districts, Gross Tons

	June (30 days)	May (31 days)	April (30 days)	March (31 days)
New York and Mass....	217,098	215,704	225,752	219,033
Lehigh Valley	70,590	76,699	85,179	93,999
Schuylkill Valley.....	38,123	46,752	53,216	64,727
Lower Susq. and Lebanon Valley	22,830	42,915	43,173	38,984
Pittsburgh district	647,545	677,743	663,679	670,100
Shenango Valley.....	67,861	72,570	67,106	68,309
Western Pennsylvania..	75,823	106,875	120,415	124,410
Maryland, Va. and Ky..	99,070	112,233	120,786	133,005
Wheeling district	149,178	168,365	156,170	116,715
Mahoning Valley.....	254,272	280,193	264,319	282,667
Central and North'n Ohio	276,559	284,849	275,700	313,805
Southern Ohio	48,444	48,264	48,463	49,410
Illinois and Indiana....	623,101	719,328	682,171	694,759
Mich., Minn., Mo., Wis., Colo. and Utah.....	126,596	144,381	140,186	129,392
Alabama	216,082	234,289	233,972	245,875
Tennessee	1,728	1,600	1,581	981
Total	2,934,900	3,232,760	3,181,868	3,246,171

To Investigate Duty on Pig Iron

Senate Empowers Tariff Commission to Make Study—May Mean Increase Under Flexible Provision of New Act

WASHINGTON, July 1.—The Senate yesterday adopted an amendment requiring the Tariff Commission to investigate the pig iron duty of $1.12½ per gross ton carried in the Hawley-Smoot law. The amendment was offered by Senator Reed of Pennsylvania. The Pennsylvania Senator was chairman of the subcommittee of the Finance Committee, which had charge of the metal schedule during consideration of the Hawley-Smoot measure.

The amendment is one of several which have been adopted since the new tariff act went into effect. The inquiries will be made under the so-called flexible provision, by which duties may be increased or decreased by 50 per cent. Under the new law the commission itself can recommend specific rates under the provision. The President may or may not accept the recommendation. He proclaims the new rates.

Some of the amendments, asking for an investigation of duties under the flexible provision, plainly are meant to bring about decreases in duties, though it is not by any means certain that this will be the result. The administration itself is said to have already instituted a rather sweeping study regarding definitely named products and rates in the new tariff act, apparently with the intention of seeing if certain rates cannot be decreased.

Purpose Believed to Be Increase

The other side of the question comes from amendments offered in the Senate which, it is believed, will bring about increased duties. It is thought the amendment of Senator Reed is proposed for that purpose. In such an instance it would be a source of satisfaction to merchant blast furnaces, particularly those along the Atlantic Seaboard, which have repeatedly urged higher duties as a means of protection against low-cost producing countries. It was on their complaint that the commission made an inquiry beginning in April, 1926, lasting almost two years, which resulted in the Fordney-McCumber duty of 75c. per ton being increased by 50 per cent to $1.12½, which was continued in the present law after a struggle in Congress.

The inquiry made at that time, when India was the chief competing country, showed that the cost of production of foundry and malleable pig iron in Eastern merchant furnaces of the United States, delivered at Philadelphia, was $26.42, against $20.01 for the Indian iron, delivered at Philadelphia, a difference of $6.41. The commission made it clear that the domestic industry at that time was entitled to a greater increase than 37½c. per ton, but that under the law no higher increase could be made.

Industry Has Urged Higher Tariff

While competitive conditions at present are not so acute as they were in 1922, and to a somewhat less extent in 1923 and 1924, the domestic industry has consistently urged a higher tariff duty than has been granted. Those supporting the Reed amendment apparently think that such a development is in prospect and, since investigations now require much less time than they did under the old law, it is felt a recommendation may be forthcoming within a reasonably short time. Actually, the commission already has much data to work from as applying to many products and, when brought up to date, action could be taken with comparative expedition. Invoices now may be relied on to a much greater extent than previously and investigations abroad are no longer required, except perhaps in certain instances.

The move of those who are seeking investigations of rates with the apparent hope that the duties will be increased is believed in some quarters to reflect a growing resentment in Congress against foreign protests and meetings directed against the new American tariff act. These protests are thought by many to be merely organized propaganda with threats of retaliation intended to intimidate the American administration into cutting tariff duties. The opposite effect would seem to be more probable, judging from the attitude of some members of Congress. There is serious doubt as to the sincerity of many of these foreign protests.

Demonstrates New Billet Gouger and Other Tools

AN improved model of the billet gouger made by the Putnam Machine Works division of Manning, Maxwell & Moore, Inc., New York, was demonstrated at the company's Fitchburg, Mass., plant June 27.

This machine is similar to that described in THE IRON AGE of March 27, page 944, except that it has a longer rail and has two tool heads on the one saddle, one head having a tool for gouging and the other having a tool for surface planing. In addition, the new model is equipped with an air-operated billet ejecting and turning mechanism. The tools used are of special planer type, and measure 5 in. across the face. Billets are fed on to the work-holding fixture from a runway at the front, machined and then discharged on to a runway at the rear of the machine, the process being continuous.

The machine was demonstrated in removing seams and other surface defects on 0.45 to 0.50 per cent carbon steel, nickel, high-speed and other alloy steel billets; high-speed steel billets having considerable camber. The cutting of "S" curves on the surface of the billets showed facility of tool control; in gouging, cuts ranging from ⅛ to ⅜ in. in depth were readily obtainable. The hydraulic table mechanism used on this particular machine included the size 50 variable-delivery oil pump built by the Waterbury Tool Co.

In addition to the billet gouger and a billet peeler, for round bars, which were of particular interest to steel mill representatives, railroad shop and other Putnam machine tools were on display for three days, June 26 to 28, for inspection by railroad shop and manufacturing plant executives. The exhibits were shown in the erecting department of the plant. All machines were painted the standard machine tool gray and were demonstrated in actual cutting. They included a 48-in. rotary slitter; planer-type open-side miller; 48-in. double-housing planer; 90-in. journal turning lathe; 90-in. quartering and pin turning machine; 72-in. continuous rotary miller; and heavy-duty double axle lathes. All of these machines are to be shipped immediately after the exposition.

Visitors were invited to inspect all departments of the plant, from the foundry and pattern shops to the assembly floor, including the welding and cutting department, which is of interest because of the comparatively large amount of welded steel construction used in some of the company's machines. The apprentice and service men's training headquarters were also open for visitation. To facilitate inspection, signs and arrows and department foremen's names were posted conspicuously about the plant.

Obituary

DIXON C. WILLIAMS, president of the Chicago Nipple Mfg. Co., Chicago, died June 23 in the Good Samaritan Hospital, Los Angeles. He was born in Yellville, Ark.

—

MAYNARD FRENCH, former steel broker and operator of the Maynard French Steel Brokerage Co., Cincinnati, died on June 24 in that city following an illness of several months. He had been retired from active business for about one year. He was 52 years old.

—

BENJAMIN F. HAUGHTON, vice-president and treasurer of the United States Pipe & Foundry Co., Burlington, N. J., died suddenly at his home in Beverly, N. J., June 25, aged 80 years. He had been identified with the company for many years and had served on the Atlantic Deeper Waterways Commission.

▲▲▲ PERSONALS ▲▲▲

CARL A. JOHNSON, president, Gisholt Machine Co., Madison, Wis., will serve as chairman, and HARRY B. GILMORE, secretary, Western Electric Co., New York, as vice-chairman of the departmental committee which will have direction of the department of manufactures of the Chamber of Commerce of the United States for the coming year.

—

RAY T. BAYLESS, formerly editor of the Transactions of the American Society for Steel Treating, has been

Ray T. Bayless

made assistant secretary in charge of technical activities.

—

H. H. PLEASANCE, formerly general manager of sales of the steel bar department of the Bourne-Fuller Co., Cleveland, now a division of the Republic Steel Corporation, has been appointed district sales manager of the Republic corporation for the Indianapolis district. This will be a new district sales office and will be located in the Circle Tower, Indianapolis. This office will serve all of Indiana but the extreme northern section, which is included in the Chicago district, and the extreme southern section, which is served from the Cincinnati office.

—

RUDOLPH E. HELLMUND, chief electrical engineer for the Westinghouse Electric & Mfg. Co., East Pittsburgh, was awarded the B. G. Lamme award for 1929 by the American Institute of Electrical Engineers at its recent meeting in Toronto, Canada.

—

E. A. BALSLEY has resigned his position with the Wheeling Mold & Foundry Co., Wheeling, W. Va., as vice-president in charge of operations. The Wheeling company was one of the units of the newly formed Continental Roll & Steel Foundry Co., whose officers were named on page 1912 of THE IRON AGE of June 26.

—

LESTER B. KNIGHT, formerly with the Illinois Clay Products Co., Chicago, has become identified with the National Engineering Co., Chicago, in the capacity of sales engineer.

—

L. P. DEEPHOUSE has been appointed district manager of the newly opened Montreal office of the Harnischfeger Corporation of Canada, Ltd., Ottawa.

—

ERNEST E. THUM, who has been associate editor of THE IRON AGE for the past three years, and in that time has contributed a number of notable articles to these columns, has resigned and will assume the editorial direction of *Metal Progress*, a journal to appear Sept. 1 under the auspices of the American Society for Steel Treating.

—

BURNHAM FINNEY, after an absence of six months on special work for the American Rolling Mill Co., has rejoined the editorial staff of THE IRON AGE, and will make his headquarters in Detroit. Versed in market reporting and experienced in the technology of the metal-working industries, he returns to this journal to cover a territory of outstanding industrial importance.

—

L. S. JOHNSTON has been added to the sales force of the Boston office of Bullard - Davis, Inc., subsidiary of Davis Emergency Equipment Co., Inc., New York. DARYL POTTER has become identified with the San Francisco office of the Davis Emergency Equipment Co., Ltd.

—

GEORGE E. J. PISTOR, of the Hay Foundry & Iron Works, New York, and treasurer of the American Institute of Steel Construction, is to sail on July 3 for a two-month tour of Europe. Incidentally, he will represent the institute at a number of important meetings abroad. On July 18 he is scheduled to deliver an address at the Hall of the Institute of Mechanical Engineers, London, on the art and the economies of the skyscraper. Three days later he will address a joint meeting of the Royal Institution of Engineers and the Association of Dutch Architects at The Hague, Netherlands. He will be the guest of the Stahlwerks-Verband, A. G., in Düsseldorf, Germany, on July 23. He is also to speak before the French structural steel interests in Paris on Aug. 20.

DAVID BARTLETT has been appointed manager of the Chicago office of the Alexander Milburn Co., Baltimore. An increased volume of stock of all equipment is to be carried in Chicago.

—

J. L. VAN NORT has been advanced to sales engineer of the Boston office of the Reliance Electric & Engineering Co., Cleveland.

—

L. J. BYRNE has been appointed representative in the Chicago territory of the Magnetic Mfg. Co., Milwaukee.

—

DAVID T. CROXTON has been elected assistant to the president of the Corrigan-McKinney Steel Co., Cleveland. He has also been made a director, the membership of the board having been increased to 10.

—

RAY H. GRISWOLD, president, Griswold-Eshleman Co., Cleveland advertising agency, who has directed the market survey work of the National Association of Flat Rolled Steel Manufacturers, believes that the manufacturers of sheets and strip steel can create a much larger outlet for their products by properly directed sales promotion and advertising. He told the association at its recent convention at White Sulphur Springs, W. Va., as reported in THE IRON AGE of June 26, page 1899, that several lines of sheet steel consump-

Ray H. Griswold

tion which are considered most susceptible to important development offer a potential market for 8,179,465 tons of sheets annually, as against a present consumption for the same purposes of 2,531,545 tons.

J. Lewis Hay

Francis W. Hay

Richard Denbigh

John L. Hay, Jr.

Hay Foundry & Iron Works 100 Years Old; Fourth Generation Now Active

CELEBRATING not only 100 years in business but 100 years under the management of the same family, the Hay Foundry & Iron Works, Newark, N. J., has issued an illustrated booklet commemorating the event. The business was established as a foundry on June 1, 1830, and has been handed down in direct lineage, and today is being conducted by a grandson of the founder, J. Lewis Hay, and two great-grandsons, John L. Hay, Jr., and Francis W. Hay.

J. Lewis Hay began his apprenticeship in 1883 at the age of 17, and in 1920 bought the interest of his younger brother, James Bruce Hay, who was named for the founder. Richard Denbigh, vice-president of the company, is the only one of the officers not of the name, but is nevertheless of the family, being a cousin of Mrs. E. C. Hay, wife of the third proprietor. Mr. Denbigh has been connected with the business for 55 years, while J. Lewis Hay's length of service is 46 years.

Other officers of the company are John L. Hay, Jr., secretary and Francis W. Hay, treasurer, both sons of J. Lewis Hay. They make the fourth generation of proprietors and executives of the company.

The history of the Hay Foundry & Iron Works parallels the development of New York as a city of skyscrapers. Among the modern structures for which it has erected the steel frame are the American Radiator Building, Transportation Building, Bank of New York & Trust Company, Saks Fifth Avenue Building, 120 Wall Street, Heckscher Building, 1 Park Avenue Building, Plaza Hotel and many others.

Prior to the advent of rolled structural shapes, the Hay Foundry & Iron Works supplied large tonnages of cast iron columns and lintels for New York buildings from its foundry. In keeping with the development of the structural steel building, the company has gradually increased its steel fabricating capacity to its present total of 70,000 tons annually.

Henry Clay Graton 100 Years Old

HENRY CLAY GRATON, founder of the Graton & Knight Co., manufacturer of leather belting, Worcester, Mass., will celebrate his one hundredth birthday anniversary July 10. He was born on a farm in Leicester, Mass., at a time when the population of the entire country was about

Henry Clay Graton

that of the metropolitan area of New York today. The gold rush to California was not yet dreamed of. Only 24 States comprised the Union, and west of the Mississippi River was wilderness and desert. Andrew Jackson was in the White House, and Madison and Monroe were still alive.

Today the Graton & Knight Co. is in its eightieth year, Mr. Graton having founded it, at the age of 21, with a friend, Joseph A. Knight. The original capital was $800, and the first plant was a two-room shop, 20 x 60 ft.

At that time railroads rendered uncertain service and travel was still largely by stage coach or on foot. Mr. Graton did practically all of his selling from a sample pack that he carried over his shoulder. As the first salesman of the Graton & Knight Co., he was appropriately called upon to make the opening address at a sales convention of the company a few weeks ago. Still alert and in good health, he can look back upon the stupendous changes that have taken place in the 100 years through which he has lived and can review with pride the growth of his own company.

Further Simplification for Concrete Bars Proposed

WASHINGTON, July 1.—The equivalent cross-sectional area of reinforcing bars will be limited to two instead of the present three decimal places, if a proposed revision of the simplified practice program is adopted. This recommendation has been made by the standing committee of the industry and has been placed before manufacturers, distributers and users for their consideration and signed acceptance.

Announcement to this effect has been made by the Division of Simplified Practice, Bureau of Standards. This modification was recommended as a means of further simplifying the work of engineering design where reinforced concrete is used, and, if accepted by the industry, will be effective Sept. 2.

The original recommendation effected a reduction in the number of cross-sectional areas of reinforcing bars from 32 to 11. The equivalent cross-sectional area for each of the 11 sizes retained was expressed to three decimal places.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

ESTABLISHED 1855

Quality May Curtail Quantity

PRODUCTION statistics of some commodities may not present a true picture of the service rendered by those commodities. Quality or serviceability may have increased out of relation to production, or there may be better methods of utilization. On this account long range predictions of increases in quantity may be out of line, an increase in service occurring without a corresponding increase in quantity. The principle is an important one and in some connections it is relatively new.

The point has been brought out with respect to coal. It helps to explain the small increase in production, almost none at all, since the war. Increased use of fuel oil and natural gas fall far short of explaining the difference.

There has been talk in the coal trade of demand being extremely light this year, but as a matter of fact it is in keeping with industrial activity and the general trend of things. Bituminous production through June 21, approximately 147 working days, is reported at 221,050,000 tons, and this while well under last year is only a trifle under 1928. To bring out the relationship in a new way we have divided coal production in the corresponding period in eight years by the Federal Reserve Board's index of industrial production, converting the quotients into a series of index numbers, averaging 100, with the following result:

Bituminous Coal Production Relative to Industrial Activity

1923	127	1927	105
1924	99	1928	90
1925	94	1929	88
1926	104	1930	91

The lower the number the smaller the proportion of coal used for a given amount of industrial activity, and the last three years run well below the preceding years. That is largely a matter of increased service secured from a ton of coal.

In steel we have the point that before the war the tonnage of finished rolled steel ran about 76 per cent of the steel ingot tonnage, while in recent years the proportion has been 74 per cent, pointing to more liberal cropping, although no one doubts that sounder ingots are being made.

Also there are statistics of alloy steel production. Before the war the proportion of alloy steel to total steel ranged about 2 per cent, while during and just after the war it was about 4 per cent, increasing to 5 per cent in 1924 and to above 6 per cent in the last two years, 6.06 per cent in 1928 and 6.86 per cent in 1929. The relatively slow growth of steel tonnage in the last ten years, relative to its rapid growth before the war, is explained partly by improvement in quality, whereby a pound gives a performance requiring more than a pound 15 or 20 years ago.

Along the same line, another old standard has gone by the board. Increased railroad traffic meant having more cars in service and when business improved the public expected the railroads to buy many more freight cars. In recent years the number of cars in service has been practically stationary, even decreasing a trifle in the last few years, while the ton-mileage has increased somewhat.

With these few, but suggestive, illustrations it becomes clear that in many connections things have not been moving in recent years as formerly. Service rendered, or work done, may be increasing in a way not indicated by certain quantitative statistics, which do not represent exactly the same thing as in the past.

Economic Equalization

COMPARING with 1913 as a base, commodity (raw material) prices in 1929 averaged 139. In May, 1930, this had fallen to about 128. The index of general price level for 1929, which is a composite of commodity prices, rents, services of many kinds, etc., was 179, according to Carl Snyder, and 180 according to W. R. Ingalls, who make this computation from entirely different angles, but have been in substantial agreement, especially during recent years. The main difference between them is that since 1922, when the depression of 1920-22 ended, Mr. Snyder has shown a general increase, while Dr. Ingalls has shown a substantially steady position.

Further analysis reveals a great unbalance in respect to many important branches of labor. The cost of building is reported about 200. Inasmuch as the raw materials entering into building have fallen far below 200, the labor component which probably constitutes 50 per cent of it must be much higher. Some authorities put that index number as high as 250.

This reveals a serious unbalance, which sooner or later is destined to be corrected. The index for labor can depart from the index for commodities only in so far as economies in production accrue to labor, which always they do, but never to such an extent in such a brief period of time as the indices have been showing.

There must, therefore, be a drawing together of these indices, which may be referred to as a deflation of labor, conforming to the deflation in commodities that has already occurred. This will probably be a painful process. It may be reasonably inferred that inasmuch as these basic indices have diverged they will gradually tend to converge in correction. This is to say that while labor rates are declining commodity prices may experience a moderate rise.

Putting this into more illustrative language, we have been experiencing a decrease in residential building and at the same time an increase in the unemployment of building labor, which has taken the position of demanding a desired wage rate or else refusing to work. Yet the population needs more dwellings, in order to house its natural increase, if for no other reasons. Obviously the recent condition can not continue indefinitely. When the cost of building falls, the public will satisfy its needs. This will increase the demand for commodities. In the end there will be more equalization.

There are some who deplore any suggestion that wages may be reduced. There are some wages that have already been reduced and ought not to be any more. There are others that are otherwise. That condition may be one of our present troubles. The idea of boosting wages, except as a reward for increased production, in order to promote buying power may have been a great fallacy.

A readjustment in wages for labor does not ipso facto mean calamity or destruction of buying power, for with decline in the cost of living real wages may not be reduced at all. Already the cost of food and clothing has been extensively reduced, but rents and many forms of service have not been reduced. The broad effect upon labor would be to cancel wilful idleness. With a reduction in nominal wages there may be even an improvement in annual real wages. Such an equalization would be of advantage to the farmers, who are producers of commodities and have been suffering from low proceeds from their sales and high costs for their purchases. We may reasonably foresee a disappearance of agrarian discontent and a restoration of farm buying power for many things, including iron and steel, not by an elevation of prices, which can not be done, but by a reduction of costs, which can be.

In other words, the national economy is not going to the dogs, but probably it is going to be readjusted and equalized upon a more healthful basis. There is going to be profit in business and corporations are going to continue to earn and pay dividends, but there are going to be changes among them. Some of them that have enjoyed feverish prosperity in providing luxuries may not do so well as heretofore, while others that have suffered from lean returns may do better.

The Tariff Set-Up

THE Hawley-Smoot law is the eighth tariff act that has been passed by the American Congress in 50 years. An average of one such law in every six years is high, and disturbing to business. The flexible provision ought to prove a vehicle to remedy the situation, or, at least, to alleviate it. Through it inequalities in rates can be quickly removed. As written into the new act, it is a much more workable instrument than the one incorporated in the Fordney-McCumber law. Likewise greater power has been given to the Tariff Commission. The President soon will announce new appointees and once reorganized the commission may be expected to take up its work. There should be no adequate reason for Congress to tinker with the tariff so often in the future as in the past.

The principal merit of the new flexible provision lies in the fact that investigations can be made expeditiously. Where the commission finds domestic and foreign costs of production are not readily ascertainable, the weighted average of the invoices or values for a representative period or the average wholesale price in the principal competing country may be taken as evidence of such costs. There will be few, if any, investigations abroad entailing delay and resentment of foreign producers.

The commission under the new law is required to specify increases or decreases in rates of duty. It is to be assumed that a high-grade bi-partisan commission will be created and that therefore it will rarely be divided in its findings, or in any case, will make majority reports. Since the commission will consist of six members, an even division necessarily is possible, though hardly probable. The President alone, however, can proclaim changed rates, but no doubt will be guided by the commission's recommendations.

That the President intends to make free use of the flexible provision is evident, for he has taken the unusual step of inviting protesting foreign nations to file complaints with the commission. Undoubtedly he has done so in entirely good faith. At the same time his action has the signs of a challenge to those countries whose complaints against the new tariffs give the impression of being mainly for home political effect.

Meanwhile an investigation in behalf of the farmer said to be owing to a senatorial urge promises to have an ironic tinge. It asks for a study of the tariff under the flexible provision on shovels, spades and other tools used by farmers, and indications are that the differences in costs in the United States and abroad may easily point to increased rather than reduced duties.

Iron Ore Scarcity, Again

AT intervals the specter of an iron ore scarcity in the United States is still made to stalk across a magazine or a Sunday supplement page, the latest appearance being in the financial section of the New York *Herald Tribune* of June 29. The article, which is without an author's name, may have been called out by the moves made at Cleveland in recent months in connection with further consolidations in the steel industry. It may also have had some measure of inspiration from the efforts made from time to time to interest in a financial way the steel producers of the United States in the extensive deposits of Brazil, which probably represent 20 to 25 per cent of the world's actual and potential iron ore reserves. Some such suggestion comes to us as we read that one "school of thought" in the American steel industry inclines to the view that "high-grade iron ores brought in ships to United States ports will fill the bulk of requirements of the American steel companies." Strangely, the article makes no reference to the time of this import regime, whether it be near or distant. It is possible that a far future situation may produce such a "school," but there is no evidence of its existence today.

It was entirely natural that the prime movers in the steel consolidations that have been in the making in northern Ohio for more than a year should tie up with iron ore firms representing the bulk of the remaining merchant ore of Lake Superior. But such

moves in themselves do not signify the imminence of any scramble for Lake ores or any urge upon our large steel producers to preempt in other countries deposits that would mean a haul of 4000 miles from dock to dock and a rail haul of several hundred miles at either end.

In 1921 the State Tax Commission of Minnesota estimated the Steel Corporation's ore holdings in that State at 900,000,000 tons. Undeveloped tracts probably represented 300,000,000 tons more, and the corporation's relatively small reserves in other Lake Superior districts would probably mean 100,000,000 tons. Eight years' shipments have subtracted upward of 200,000,000 tons. With allowance for additions developed since 1921, the estimate of the *Herald Tribune* writer that the Steel Corporation has something like a 40-years' supply of high-grade ore in Lake Superior is probably not far wrong. The further estimate of 15 to 20 years' supply for the Lake mines of the five or six leading independent producers is low and does not take account sufficiently of the recent tie-ups with the strong merhant ore interests centered in Cleveland.

What is overlooked in all computations that point to a scarity of high to medium-grade Lake ores as just around the corner is the retarded rate of ore exhaustion due to the large and increasing use of scrap and to the technical advance in steel making that is steadily adding to the corrosion resistance of steel in service and to the size of the load which a given weight of steel will support.

Repeatedly we have pointed to the increasing spread between pig iron production and steel ingot production. The vast stores of steel that has served its day in railroad track, in cars, in structural uses and in every form of machinery are finding their way back to the melting furnace in larger and larger tonnages. The country's steel-making material above ground, accumulating with every year, has been markedly reducing our dependence upon our underground stores; to such an extent, indeed, that the after-us-the-deluge treatment of the question of iron ore supply has gone quite out of fashion.

Increases in Tubular Goods

IN the last 24 years production of fire-welded and seamless iron and steel tubular goods has been multiplied three and one-third times, and the increase has been more than one-third greater than the increase in all finished iron and steel products. This is by the official statistics, which omit from the reckoning a certain electrically-welded pipe, produced in large quantities in the last two years.

Dividing the 24 years into three eight-year periods, 1905 to 1913, 1913 to 1921, and 1921 to 1929, the tubular goods production increased 82.2 per cent in the first period, against a much smaller increase in other lines; 18.8 per cent in the second period, against a small decrease elsewhere, and 56.3 per cent in the third period, slightly less than the gain elsewhere. To arrive at these percentages some estimating is necessary, as the statistics of pipe and tube production begin with 1913, while skelp begins with 1905. As pipe was 90 per cent of skelp in 1913, that proportion is taken for 1905, and the seamless production of that year was negligible. For 1921, a badly off year, the convention is used of averaging 1920-1-2.

In 24 years these tubular goods increased 234.4 per cent, against 143.9 per cent for all rolled iron and steel. In the first third of the time, tubular goods averaged 7.8 per cent annual increase, in the second third the average was 2.2 per cent, and in the third it was 5.7 per cent, the annual average for 24 years being 5.2 per cent.

The official statistics of welded pipe and seamless tube production show first what may be considered an independent growth of seamless and, second, a growth at the expense of welded.

Production of Pipe—Gross tons

	Welded	Seamless	Total
1913	2,245,532	108,567	2,354,099
1914	1,737,704	90,595	1,828,299
1915	1,919,674	139,668	2,059,342
1916	2,651,058	190,473	2,841,531
1917	2,486,977	226,675	2,713,652
1918	2,290,479	292,894	2,583,373
1919	2,374,931	197,369	2,572,300
1920	3,002,725	291,570	3,294,295
1921	1,987,442	117,884	2,105,326
1922	2,732,236	257,835	2,990,071
1923	3,351,023	403,783	3,754,806
1924	2,824,256	261,157	3,085,413
1925	3,030,541	568,190	3,598,731
1926	3,402,515	775,329	4,177,844
1927	3,117,451	864,140	3,981,591
1928	2,923,910	1,078,927	4,002,837
1929	3,018,740	1,303,485	4,322,225

A quarter century and more ago there was large production of seamless tubing in point of length, but it did not run much into tonnage. A substantial increase then occurred by seamless largely displacing welded for boiler tubes. Later came deep oil and gas wells, seamless being used both for rotary drilling and for casing. Now seamless is coming into vogue for pipe lines. Production of "standard" or ordinary merchant pipe was record high in 1926, 1,903,848 gross tons, since when it has decreased, amounting to 1,709,029 tons in 1929, or fully 10 per cent decline. This was a loss in consumption, there being no material swing to seamless in that category.

CORRESPONDENCE

Problem of the Unemployed

To the Editor: The perfection of labor-saving machinery in nearly every field of endeavor has thrown hundreds of thousands of men out of employment and caused even greater numbers to be employed on part time. There are several solutions:

1.—A good percentage of laborers and mechanics move to the rural sections and cultivate small farms 3 to 5 acres during spare time to provide necessary food for their families (there are hundreds of thousands of farms of all sizes which have been deserted). In times of depression he and his family would at all times be nourished better, the children enjoy a more healthy life than afforded in cities.

2.—Inventors should be encouraged. All concerns should have research departments to produce new inventions. Just as the automobile industry gives employment to over a million, aviation to hundreds of thousands, electric ap-

The Week in Business

Drift of Current Financial and Economic Opinion

FOLLOWING up its optimistic views of the past few weeks, Harvard Economic Society now estimates the volume of manufacture in May at 97 per cent of normal. Sharp declines in some lines —steel, automobiles, cotton textiles, boots and shoes—have been partly offset by advances in some elements of the food group, which stands at the highest point in a year. For June the view is expressed that "for manufacture as a whole . . . the index will continue the generally sidewise movement."

Upturn Thought Already in the Making

That the tide is definitely turning is the expressed belief of *Business Week*, which notes, among other things, that earnings of 246 leading corporations in the first quarter were less than 1 per cent below those of the same period of 1928—itself a great year. "Progress will be slow, irregular, spasmodic, with sporadic relapses, successively less frequent and sharp, until the end of July," says that paper. "Then, in the same weeks when, a year ago, the downturn began, a decisive recovery will set in."

Subsidence of the attitude of forced optimism of earlier in the year is not necessarily an unfavorable development, in the view of the Guaranty Trust Co. of New York. "It has become manifest that the conditions underlying the present depression are more than psychological. Optimism is an excellent foundation for business policy, but a sane optimism is not inconsistent with a frank recognition of unpleasant facts. Business has definitely settled down to the expectation of a dull summer. . . . (But) it is logical to assume that the autumn stimulus will provide the next opportunity for an upturn."

Basic Conditions Remain Unimpaired

Our mechanical facilities for production and distribution are wholly unimpaired, points out a writer quoted by *Commerce and Finance*. The potential consuming power of the people remains high. Faith will return, but until it does so the volume of trade will continue low. "Meanwhile, time is on the side of recovery, for there has been a more marked falling off in production than in consumption."

An arch optimist is Franklyn Hobbs, Central Trust Co., Chicago, who told the National Association of Purchasing Agents that the year "promises a manufacturing output and merchandise turnover equal to the last five-year average; a freight movement above that average; a volume of employment not more than 2 per cent below the average; a total payment of salaries and wages not more than 1 per cent below the average; and, most important, an actual gain in the total of agricultural income."

Observers Hark Back to 1921

Offsetting this roseate viewpoint is that of Benjamin Baker, in *Annalist*, who forecasts "somewhat greater depression in mid-summer, and an ultimate bottom uncomfortably close to that of 1921. It is reasonable to hope," he says, "that August may produce a rise in the business index line, probably followed by successive rises in September and perhaps in October."

Long-Term Outlook Improving

This year's "extraordinary amount of pessimism" is credited by Alexander Hamilton Institute to the fact that the present summer "seasonal decline started from a spring peak approximately 13 per cent below that of a year ago." That the long-term outlook is better is the view of the Union Trust Co., Cleveland, which suggests that "at this very time, when confidence appears at its lowest ebb, we may actually be passing through the opening phase of a long period of increasing business prosperity."

pliances and radio to hundreds of thousands more, new inventions, small or large, would constantly absorb the unemployed.

3.—The inventor must necessarily be the saver of our present industrial civilization, but how often he is deprived of the fruits of his labor, discouraged, ridiculed and finally his creative imagination ceases. Very often the inventor is a poor, inexperienced man. There are foundations for medical research, for scientific research, for astronomical research, etc., but in this very important field there is no help for the struggling man.

Some men of means would benefit this, as well as succeeding, generations, by establishing an inventors' foundation. This could be made self-supporting by requiring the inventor to contribute a certain portion of the selling price or income from his invention to the foundation in cases where it has helped him. The poor inventor could receive advice, have his patent applications prepared and even be advanced the requisite fees.

H. WIDMER,
Widmer Roofing Co.
Paterson, N. J.

Coke Production at Lower Level

WASHINGTON, June 28.—The daily output of 8930 tons of beehive coke in May was the lowest in the statistical record of the industry, and the average of 137,598 tons of by-product coke was 2.8 per cent below April, according to the Bureau of Mines.

Beehive coke production in May was 241,100 tons, while the by-product output was 4,265,528 tons, a total of 4,506,628 tons. This compares with 4,548,136 tons in April, consisting of 301,700 tons of beehive and 4,246,436 tons of by-product coke. The decrease in by-product coke output in May was borne entirely by furnace plants, the Bureau pointed out, for the daily average at merchant plants was the same for the two months.

During May, the Jones & Laughlin Steel Corporation increased its battery of ovens at Aliquippa by the addition of 81 Koppers-Becker ovens.

Total coke production for the first five months of 1930 was 22,540,251 tons, consisting of 21,105,551 tons of by-product and 1,434,700 tons of beehive coke. In the first five months of 1929, coke output totaled 24,702,065 tons, consisting of 22,184,165 tons of by-product and 2,517,900 tons of beehive coke.

Steel barrels shipped in May by members of the Steel Barrel Manufacturers Institute numbered 502,188 and their total business aggregated $1,380,412. Of their capacity for producing I. C. C. barrels 16.2 per cent was engaged and 50.1 per cent of the capacity for light barrels.

Iron and Steel Markets

Pig Iron Output Declines 6.2 Per Cent

Production Drops 6453 Tons a Day in June—First Half Total Only 1.4 Per Cent Lower Than in 1928—Steel Output Recedes Further

MEASURED in terms of pig iron output, the half year just completed makes a good showing compared with 1928, but falls far short of the performance of 1929. Estimates of June production indicate that the total for the first six months of 1930 was 18,262,000 tons, a decline of nearly 16 per cent from the corresponding period last year, but only 1.4 per cent behind the first half of 1928.

The current trend, influenced by seasonal reaction, is rather sharply downward. The daily rate in June, 97,830 tons, was 6.2 per cent lower than in May, and was the smallest for any month since January. Curtailment of blast furnace operations was the greatest since December. With 20 furnaces blown out and only one lighted, there was a net loss of 19 active stacks compared with 20 in the last month of 1929.

Several additional furnaces may be banked or blown out shortly, but the trade believes that it is now passing through the worst phase of industrial retrenchment and that improvement is not many weeks distant.

While many iron and steel consuming plants will shut down for two weeks this month, it is reasoned that these suspensions will promote the liquidation of manufactured goods in stock and clear the way for fresh purchases of materials.

Steel mill operations are at the lowest rate of the year and will decline further, since July 4 is one of the two holidays of the year that are generally observed by the industry. Some mills have been shut down for the entire week and others will suspend from Thursday night until Monday morning. Blast furnace and open-hearth operations are not affected in the same degree. Steel ingot output for the country at large now averages 60 per cent, compared with 64 per cent a week ago, and may dip to 50 per cent before the holiday period has passed. The current Steel Corporation average is 70 per cent, against 72 per cent seven days ago.

Neither buyers nor sellers are evincing much interest in third quarter contracts. Many consumers still have material coming to them on old commitments and are not disposed to make further purchases until the price situation clarifies. Some producers, on the other hand, are unwilling to take contracts at prevailing prices, in view of the possibility of an advance in the market before the end of the quarter.

Resistance to price pressure is becoming more determined and there is a growing belief that the market is scraping bottom. Scrap, a barometer that is always closely watched, is still soft, but has been inactive of late and free from widespread price changes. Heavy melting grade is off 25c. a ton at Pittsburgh and St. Louis, but is unchanged at other centers.

Pig iron is off 50c. a ton at Cleveland, but appears to be holding in most other markets. Producers of merchant iron are slowing down furnace output as much as possible and in some instances plan to blow out additional stacks. Considerable stock iron has accumulated, but it is largely in hands of makers. In 1921 the consuming trade had large surplus stocks, which were dumped on the market for what they would bring.

Finished steel prices have undergone few further changes. Fender stock now ranges from 3.70c. to 3.80c. a lb., Pittsburgh or Cleveland, a decline of $2 a ton in the minimum quotation. On the Pacific Coast, merchant bars and shapes have been reduced $2 a ton and in the South blue annealed sheets have been marked down $1.

The mid-year suspensions by consuming industries make it difficult to gage the trend of demand. More business was booked in June than in May by several mills making heavier rolled products, but this gain was more than offset by the decline in the bookings of producers catering largely to the automotive trade. Barrel manufacturers and radio makers are among miscellaneous users that have increased their steel orders of late.

The large amount of pending structural steel business and the steady flow of tonnage to shipbuilders remain encouraging factors. Pipe line tonnage is still being booked, but, with mills committed far ahead, deliveries are becoming more of a problem, with the possibility that several projects will be put off until next year.

Two ships awarded to the Newport News yard by the Eastern Steamship Co. will require a total of 8000 tons of plates, shapes and bars. Bids on two vessels each have been received by the Oriental Steamship Co. and the Quaker Line. Cuban-American interests are preparing plans for two large railroad car floats to ply between New Orleans and Havana.

Complete pig iron estimates for June show a production of 2,934,900 tons (97,830 tons a day), which compares with 3,232,760 tons (104,283 tons a day) in May. One hundred sixty-one furnaces were active July 1, as against 180 June 1.

Water shipments of Lake Superior iron ore in June totaled 8,650,441 tons, compared with 10,174,424 tons in the same month last year—a decline of 15 per cent. Shipments for the season to July 1 were 15,737,573 tons, against 22,239,938 tons in 1929, a recession of 29 per cent.

THE IRON AGE composite prices are unchanged, entering the second half at the lowest levels of the year. Pig iron, at $17.42 a gross ton, is 79c. lower than at the beginning of 1930; finished steel, at 2.185c. a lb., is $3.54 a net ton lower.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	July 1, 1930	June 24, 1930	June 3, 1930	July 2, 1929
No. 2 fdy., Philadelphia	$19.76	$19.76	$19.76	$21.76
No. 2, Valley furnace	18.50	18.50	18.50	18.50
No. 2 Southern, Cin'ti	16.69	16.69	16.69	18.69
No. 2, Birmingham	14.00	14.00	14.00	15.00
No. 2 foundry, Chicago*	18.00	18.00	18.50	20.00
Basic, del'd eastern Pa.	18.75	18.75	18.75	20.25
Basic, Valley furnace	18.50	18.50	18.50	18.50
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	20.76
Malleable, Chicago*	18.00	18.00	18.50	20.00
Malleable, Valley	19.00	19.00	19.00	19.00
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	94.00	105.00
Rails, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh	31.00	31.00	31.00	35.00
Slabs, Pittsburgh	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh	36.00	36.00	37.00	40.00
Wire rods, Pittsburgh	36.00	36.00	36.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.85
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.65	1.65	1.75	1.95
Bars, Chicago	1.75	1.75	1.85	2.05
Bars, Cleveland	1.75	1.75	1.75	1.95
Bars, New York	1.98	1.98	2.08	2.29
Tank plates, Pittsburgh	1.65	1.65	1.70	1.95
Tank plates, Chicago	1.75	1.75	1.80	2.05
Tank plates, New York	1.93	1.93	1.98	2.22½
Structural shapes, Pittsburgh	1.65	1.65	1.70	1.95
Structural shapes, Chicago	1.75	1.75	1.80	2.05
Structural shapes, New York	1.90½	1.90½	1.90½	2.19½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.30
Hot-rolled strips, Pittsburgh	1.65	1.65	1.70	1.90
Cold-rolled strips, Pittsburgh	2.45	2.45	2.45	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel,	July 1, 1930	June 24, 1930	June 3, 1930	July 2, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.55	2.55	2.55	2.85
Sheets, black, No. 24, Chicago dist. mill	2.65	2.65	2.65	3.05
Sheets, galv., No. 24, P'gh	3.15	3.15	3.20	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.25	3.25	3.30	3.80
Sheets, blue, No. 13, P'gh	2.15	2.15	2.15	2.35
Sheets, blue, No. 13, Chicago dist. mill	2.25	2.25	2.25	2.45
Wire nails, Pittsburgh	2.05	2.05	2.15	2.65
Wire nails, Chicago dist. mill	2.15	2.15	2.20	2.70
Plain wire, Pittsburgh	2.30	2.30	2.30	2.50
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.55
Barbed wire, galv., Pittsburgh	2.80	2.80	2.80	3.30
Barbed wire, galv., Chicago dist. mill	2.85	2.85	2.85	3.35
Tin plate, 100-lb. box, P'gh	$5.25	$5.25	$5.25	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$14.75	$15.00	$15.25	$18.25
Heavy melting steel, Phila.	12.50	12.50	13.00	16.50
Heavy melting steel, Ch'go	12.00	12.00	12.25	14.75
Carwheels, Chicago	13.50	13.50	13.75	14.00
Carwheels, Philadelphia	14.50	14.50	14.50	16.00
No. 1 cast, Pittsburgh	13.50	14.25	14.25	15.50
No. 1 cast, Philadelphia	13.00	13.00	14.00	16.50
No. 1 cast, Ch'go (net ton)	12.00	12.00	12.75	14.50
No. 1 RR. wrot., Phila.	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	10.00	10.00	10.50	13.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.50	$2.75
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	12.12½	12.12½	13.12½	18.12½
Electrolytic copper, refinery	11.75	11.75	12.75	17.75
Tin (Straits), New York	30.05	30.75	30.12½	44.62½
Zinc, East St. Louis	4.10	4.37½	4.65	6.70
Zinc, New York	4.45	4.67½	5.00	7.05
Lead, St. Louis	5.15	5.15	5.40	6.80
Lead, New York	5.25	5.25	5.50	7.00
Antimony (Asiatic), N. Y.	7.00	7.00	7.25	8.75

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

PITTSBURGH

Holiday Suspensions Fairly General—Some Mills Idle Three Days or Longer

PITTSBURGH, July 1.—Because of the holiday this week and widespread suspensions during the month by leading consumers of steel, mills in this district are occupied at the lowest rate of the year. Blast furnace and steel-making capacity is not affected so sharply, and the average steel ingot-making rate in Pittsburgh and nearby districts is not below 60 per cent.

Finishing mills, on the other hand, are not engaged at even this rate, as many tin, sheet and strip units are completely suspended this week, and others are running only three days. This tendency is in evidence in other departments as well, as July 4 is one of the two annual holidays generally observed throughout the industry, and its occurrence on Friday obviously makes it impractical for mills to resume before the next Monday.

Finished steel prices continue very weak, but the tendency on the part of mills to refuse to recognize lower quotations is more pronounced. On products in which the bulk of the tonnage, even though not the majority of orders, has been going at concessions, the carload and mixed carload lot price is still officially designated as the market, at least in the immediate Pittsburgh territory. This is particularly true in the case of bars, plates and shapes, on which desirable tonnages have commanded 1.65c. or less for some time, as compared to a quoted market of 1.70c. on plates and shapes and 1.75c. on bars. No other price reductions are reported, and, in the case of black sheets, the market seems to have a firmer tone. This is also true of strip steel, and to a lesser extent of continuous mill sheets. The wire market is holding in spite of the fact that nails are weak in nearly all the important consuming centers. Only in the immediate Pittsburgh district does the $2.15 price on nails still have some significance.

With the second half of the year under way, steel companies are generally glad to forget about the first six months. Comparisons with the preceding year are exceedingly disheartening, and nearly all important statistics of the industry for the last six months compare unfavorably with the average for the same period in the last two years. It is unlikely that company profits have suffered as much from low output as from reduced prices on finished goods.

The market on primary materials still shows diverse trends. With buying at a minimum, pig iron quotations at Pittsburgh and in the Valley are nominally unchanged, although most users are convinced that inquiry for a sizable tonnage would develop concessions. Scrap is again weaker, the

average price for heavy melting steel standing this week at $14.75, following two weeks at $15, and a similar period at $15.25.

Pig Iron.—In a market untested by substantial buying, no sales are reported at less than $18.50, Valley, for foundry and basic iron and $19 for malleable and Bessemer. With the Pittsburgh furnace quoting prices 50c. a ton higher and having the advantage of lower freight rates to Allegheny County consuming points, Valley producers are naturally forced to make lower base prices in this district, but this condition has prevailed ever since the Neville Island stack went into blast last year. Consumers in the immediate Pittsburgh district are generally unable to place orders for foundry iron at less than $19.63 to $20.13, delivered, although most of them are of the opinion that a concession of at least 50c. could be obtained on a substantial tonnage. However, under present conditions buyers of iron prefer to await business developments rather than commit themselves even to extent of the third quarter. The Westinghouse Electric & Mfg. Co. has not yet closed against its third quarter requirements for Trafford City, Pa., and Cleveland, and no new inquiry has appeared. A Cleveland maker is reported to be soliciting business in the Youngstown district, but, so far as can be learned, is making no more progress than local interests in developing anything but carload lots.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—A few small buyers of billets, slabs and sheet bars have renewed their contracts at prices which have prevailed recently, although the tonnage involved is negligible. Large consumers are taking shipments in reduced volume. Forging billets are quiet, with the price fairly well established at $36. Higher quotations have passed out of the picture, and likewise the $32 price on billets, slabs and sheet bars is no longer significant. Consumers of wire rods have generally contracted for this quarter at $36, Pittsburgh or Cleveland. Skelp is moving rather heavily at nominal prices.

Steel mills occupied at lowest rate of year because of holiday suspensions and "vacations" in consumers' plants.

* * *

Average ingot rate in Pittsburgh and nearby districts not below 60 per cent.

* * *

Finished steel prices continue weak, but are not quotably lower.

* * *

Pig iron buying at low ebb. Price unchanged in absence of attractvie tonnage.

* * *

Scrap prices easier. Heavy melting steel, however, is not plentiful.

Bars, Plates and Shapes.—In the immediate Pittsburgh district makers of heavy hot-rolled products have made no public revisions of their quotations of 1.75c., Pittsburgh, on bars, and 1.70c. on plates and shapes. Lower published prices apply generally to outside markets, although large consumers in this territory have been able to get a 1.65c. price on all three of these products for some time. Nevertheless, there are few orders of desirable proportions coming out to test the market. Demand is light in this territory, although well sustained activity in structural steel and reinforcing bars in other districts is improving the rolling schedules of local mills. New inquiry is also in good volume, particularly in the East. Demand for merchant bars is very light, and has been seriously affected by the lethargy of the automobile industry.

Rails and Track Supplies.—The Pennsylvania Railroad will open bids on July 9 for its third quarter tie plate requirements, consisting of up to 100,000 plates. Otherwise new inquiry for either rails or accessories is very light, and little business has been placed in recent weeks. Reports of reduced operating revenues by railroads have prompted them to postpone purchases in every possible way, but much of this business must necessarily be placed at a later date. The Norfolk & Western seems to be the only Eastern road which has placed a secondary rail order.

Tubular Goods.—With the Fourth of July holiday out of the way, pipe mills here and in the Valley districts are expected to increase operations on line pipe to practical capacity. Pipe tonnage for rolling this year is still being placed on company books, but delivery is becoming more of a problem, and it is now likely that several line pipe projects which have been talked about from time to time this year will be put off until next season. Mills are booked well into the fall on practically all sizes of line pipe. Standard pipe is still quiet, and little promise is held out for marked recovery this year. Oil country tubing is maintaining recent activity, while mechanical tubing and boiler tubes are exceptionally dull.

Wire Products.—Third quarter contracting has stimulated the wire business slightly in the last week or two, but shipments have remained light, and specifications are coming in at reduced volume. The depressed state of the automobile industry has seriously curtailed demand for manufacturers' wire, and the merchant trade is doing little buying. Prices are well maintained, except in the case of wire nails, on which sharp concessions have appeared in some territories. In the Pittsburgh district the $2.15 quotation still prevails, and concessions of $1 a ton from this price

The Iron Age Composite Prices

Finished Steel

July 1, 1930, 2.185c. a Lb.

One week ago	2.185c.
One month ago	2.214c.
One year ago	2.412c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1930	2.362c., Jan. 7;	2.185c., June 24
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

July 1, 1930, $17.42 a Gross Ton

One week ago	$17.42
One month ago	17.50
One year ago	18.63

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1930	$18.21, Jan. 7;	$17.42, June 24
1929	18.71, May 14;	18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.75c.
F.o.b. Chicago	1.75c. to 1.85c.
Del'd Philadelphia	1.94c. to 2.04c.
Del'd New York	1.98c. to 2.08c.
F.o.b. Cleveland	1.70c. to 1.75c.
F.o.b. Lackawanna	1.75c. to 1.85c.
F.o.b. Birmingham	1.90c.
C.i.f. Pacific ports	2.25c.
F.o.b. San Francisco mills	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.65c. to 1.75c.
F.o.b. P'gh mills, cut lengths	1.90c. to 2.00c.
F.o.b. Birmingham, mill lengths	1.90c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.65c. to 1.70c.
F.o.b. Chicago Heights mill	1.75c.
Del'd Philadelphia	1.94c. to 1.99c.

Iron

Common iron, f.o.b. Chicago	1.90c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.70c.
F.o.b. Chicago	1.75c. to 1.80c.
F.o.b. Birmingham	1.90c.
Del'd Cleveland	1.83½c. to 1.88½c.
Del'd Philadelphia	1.85½c. to 1.90½c.
F.o.b. Coatesville	1.75c. to 1.80c.
F.o.b. Sparrows Point	1.75c. to 1.80c.
F.o.b. Lackawanna	1.75c. to 1.80c.
Del'd New York	1.93c. to 1.98c.
C.i.f. Pacific ports	2.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.70c.
F.o.b. Chicago	1.75c. to 1.80c.
F.o.b. Birmingham	1.90c.
F.o.b. Lackawanna	1.75c. to 1.80c.
F.o.b. Bethlehem	1.75c. to 1.80c.
Del'd Cleveland	1.83½c. to 1.88½c.
Del'd Philadelphia	1.76c. to 1.81c.
Del'd New York	1.90½c. to 1.95½c.
C.i.f. Pacific ports	2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.75c.
Wider than 6 in., P'gh	1.65c.
6 in. and narrower, Chicago	1.85c. to 1.90c.
Wider than 6 in., Chicago	1.75c. to 1.80c.
Cooperage stock, P'gh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.45c. to 2.55c.
Strips, Cleveland	2.45c. to 2.55c.
Strips, del'd Chicago	2.73c. to 2.83c.
Strips, Worcester	2.60c. to 2.70c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.70c. to 3.80c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.05 to $2.25
Cement coated nails	2.05 to 2.25
Galvanized nails	4.15 to 4.25

	Base per Lb.
Polished staples	2.60c. to 2.70c.
Galvanized staples	2.85c. to 2.90c.
Barbed wire, galvanized	2.80c. to 2.90c.
Annealed fence wire	2.30c. to 2.40c.
Galvanized wire, No. 9	2.75c. to 2.85c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.30c.
Spring wire	3.30c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.15 to $2.30 (keg)
Annealed fence wire	2.40c. to 2.50c. (lb.)
Bright hard wire to manufacturing trade	2.35c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh	2.00c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.10c.
No. 10, blue annealed, del'd Phila.	2.32c. to 2.42c.
No. 10, blue annealed, B'ham	2.15c. to 2.20c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.15c.
No. 13, f.o.b. Chicago dist.	2.25c.
No. 13, del'd Philadelphia	2.44c.
No. 13, blue annealed, B'ham	2.30c. to 2.35c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.80c. to 1.90c.
No. 13 gage, f.o.b. P'gh	1.95c. to 2.05c.

(Usual range 24 in. to 48 in. wide)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.55c.
No. 24, f.o.b. Chicago dist. mill	2.65c.
No. 24, del'd Philadelphia	2.84c.
No. 24, f.o.b. Birmingham	2.70c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh	3.70c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.15c. to 3.20c.
No. 24, f.o.b. Chicago dist. mill	3.25c. to 3.30c.
No. 24, del'd Cleveland	3.33½c. to 3.38½c.
No. 24, del'd Philadelphia	3.44c. to 3.49c.
No. 24, f.o.b. Birmingham	3.35c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c. to 2.85c.
No. 28, f.o.b. Chicago dist. mill	2.90c. to 3.00c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.60c.

Long Ternes

No. 24, 8 lb. coating, f.o.b. mill	3.65c. to 3.75c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.80c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.30
15-lb. coating I.C.	12.90
20-lb. coating I.C.	14.00
25-lb. coating I.C.	$15.20
30-lb. coating I.C.	16.00
40-lb. coating I.C.	17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49½	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

which prevailed last week have been withdrawn.

Sheets.—With at least half the sheet mill capacity in Pittsburgh and nearby districts not being operated this week and the remainder for only three or four days, sheet production is at the lowest point of the year. Although a part of this inactivity may be attributed to the holiday Friday, most mills are glad of an opportunity for suspension. Demand has not improved, and both sellers and consumers have been apathetic about third quarter contracting. Buyers feel reasonably sure that they will not be forced to pay more for their steel before the end of the quarter and producers are not anxious to be committed beyond the end of August in case business improves. As usual, the trend of activity is largely dependent upon the automotive industry, which just now offers little encouragement for the summer months. Only one large maker is even reasonably busy at present, but, after fortnight suspensions this month, others are expected to get into production on new models and to run fairly well for at least a few weeks. Other consuming lines are restricting shipments, but their inventories are low and all would immediately reflect a business turn.

Prices are unchanged and are being given little test. In the Cleveland and Detroit territories reports of concessions from 2.55c., Pittsburgh, on black sheets are not uncommon, but this figure is certainly representative of the market in this district. Galvanized sheets are quotable at a range of 3.15c. to 3.20c., Pittsburgh. Light plates and blue annealed sheets are unchanged, while automobile body stock has settled to a flat 3.60c.

Strip Steel.—Operations in strip departments this week are not unlike those of the sheet mills, although fewer companies have their plants entirely idle. This is principally because consumers are generally unable to run for an entire week without raw material shipments and indicates the close regulation of supply to demand. New business booked during June set a new low mark for the year with most producers, and shipments this month are expected to make a similar record. The more important consumers have shown little or no interest in their third quarter requirements, while smaller buyers placed contracts as usual at the prevailing market quotations. The market on hot-rolled strip must still be shown at a range of 1.65c. to 1.70c., Pittsburgh, for material wider than 6 in. and 1.75c. to 1.80c. for the narrower widths. On cold-rolled, occasional small lots are going at 2.55c., Pittsburgh, although the market generally is 2.45c.

Cold-Finished Steel Bars and Shafting.—June business generally set a new low mark for the year, but a part of the decrease must be attributed to seasonal influences. The farm implement industry ordinarily reduces its requirements in the late spring and automotive tonnage may be expected to decline. Recent price weakness in soft steel bars is not reflected in cold-finished prices. On a recent desirable Government tonnage bids were generally at 2.10c., Pittsburgh.

Tin Plate.—Complete suspension at several plants because of the holiday this week makes an estimate of tin plate operations unwarranted, but there has been little change in the rate of specifications. Shipments during July promise little curtailment, although incoming tonnage will likely show the usual summer decline. Container manufacturers are running well and the only material decrease in plate demand comes from users serving the oil industry. The second-half price remains unchanged at $5.25 a base box, Pittsburgh.

Coke.—This market is in the midst of summer inactivity. Prices on the furnace grade are unchanged at $2.50, Connellsville, while the foundry material ranges from $3.25 to $4.85, ovens. The latter price, applying to the premium brands, is well maintained.

Old Material.—With mill buying again confined to scattered lots and small tonnages, the scrap market this week has eased off slightly, and No. 1 heavy melting steel is quotable at $14.50 to $15. One mill paid $14.75 for a fair-sized tonnage, while others bought at $15. A small sale at $15.25 called for a particularly good grade of railroad material, which would normally command a slight premium over the regular market. As production of scrap is declining in all the principal originating centers, the open-hearth grades are not plentiful in Pittsburgh, and $14.50 represents virtually the minimum figure at which dealers can cover against old orders. Hydraulic compressed sheets are quotable at the same range as steel, while bundled sheets are off 50c. a ton. Machine shop turnings and blast furnace material are also lower, and No. 1 cast is definitely weaker. Other grades are essentially unchanged.

The Pennsylvania Railroad list, which closes on July 2, contains 37,000 tons of scrap.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel	$14.50 to	$15.00
No. 2 heavy melting steel	13.00 to	13.50
Scrap rails	14.50 to	15.00
Compressed sheet steel	14.50 to	15.00
Bundled sheets, sides and ends	12.50 to	13.00
Cast iron carwheels	15.00 to	15.50
Sheet bar crops, ordinary	15.50 to	16.00
Heavy breakable cast	11.50 to	12.00
No. 2 railroad wrought	14.50 to	15.00
Hvy. steel axle turnings	12.50 to	13.00
Machine shop turnings	9.00 to	9.50
Acid Open-Hearth Grades:		
Railr. knuckles and couplers	17.00 to	18.00
Railr. coil and leaf springs	17.00 to	18.00
Rolled steel wheels	17.00 to	18.00
Low phos. billet and bloom ends	19.50 to	20.00
Low phos. mill plates	17.00 to	17.50
Low phos. light grades	17.00 to	17.50
Low phos. sheet bar crops	18.00 to	18.50
Heavy steel axle turnings	12.50 to	13.00
Electric Furnace Grades:		
Low phos. punchings	17.00 to	18.00
Heavy steel axle turnings	12.50 to	13.00
Blast Furnace Grades:		
Short shoveling steel turnings	9.25 to	9.75
Short mixed borings and turnings	9.25 to	9.75
Cast iron borings	9.25 to	9.75
Rolling Mill Grades:		
Steel car axles	21.50 to	22.50
Cupola Grades:		
No. 1 cast	13.00 to	14.00
Rails 3 ft. and under	16.50 to	17.00

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.50c.
Galv. sheets (No. 24), 25 or more bundles	4.15c.
Light plates, blue annealed (No. 10), 1 to 24 plates	2.85c.
Blue annealed sheets (No. 13)	3.00c.
Galv. corrug. sheets (No. 28), per square	4.03c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 and 10 per cent off list
Machine bolts, 100 count,	60 and 10 per cent off list
Carriage bolts, 100 count,	60 and 10 per cent off list
Nuts, all styles, 100 count,	60 and 10 per cent off list
Large rivets, base per 100 lb.	$3.30
Wire, black, soft ann'l'd, base per 100 lb.	$2.60 to 2.70
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg	2.45
Cement coated nails, per keg	2.65 to 2.80

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Census Returns Show Few Unemployed

According to preliminary returns covering about one-fourth of the population of the country, the total number of persons usually having a gainful occupation who were reported at the time of the census in April as having no job, although able to work and looking for a job, amounted to 574,647, or 2 per cent of the total population of the territory covered, which numbered 29,264,480. The figures cover 756 counties and 75 cities not included in these counties.

Bi-monthly examination of the sales records of Western bar iron manufacturers subscribing to an agreement with the Amalgamated Association of Iron, Steel and Tin Workers disclosed an average sales price of 1.95c. a lb. in the May-June period, the same figure which prevailed in the two months previous.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$31.00
Rerolling, 4-in. and under 10-in., Youngstown	31.00
Rerolling, 4-in. and under 10-in., Cleveland	31.00
Rerolling, 4-in. and under 10-in., Chicago	33.00
Forging quality, Pittsburgh	36.00

Sheet Bars
(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$31.00
Youngstown	31.00
Cleveland	31.00

Slabs
(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$31.00 to $32.00
Youngstown	31.00
Cleveland	31.00

Skelp
(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.70c.
Universal	1.70c.
Sheared	1.70c.

Wire Rods
(Common soft, base)

	Per Gross Ton
Pittsburgh	$36.00
Cleveland	36.00
Chicago	37.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	10.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed 52% manganese, from the Caucasus	28.00c. to 30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	28.00c. to 30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$14.00 to $16.50
	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00
	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.50
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	90c. to 1.10
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.25

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	39.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$30.00	13%	$34.00
11%	32.00	14%	36.00
12%	34.00	15%	39.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$21.50	11%	$24.50
7%	22.00	12%	25.50
8%	22.50	13%	26.50
9%	23.00	14%	28.50
10%	23.50	15%	31.50

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd ..... $1.30 to $1.40

Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads ..... 11.00c.

Ferrovanadium, per lb. contained vanadium, f.o.b. furnace ..... $3.15 to $3.65

Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads $160.00

Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton $91.00

Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton $122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to 18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73
†Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ¾ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh	80, 10, 10 and 5
Stove bolts in packages, Chicago	80, 10, 10 and 5
Stove bolts in packages, Cleveland	80, 10, 10 and 5
Stove bolts in bulk, P'gh	80, 10, 10, 5 and 2½
Stove bolts in bulk, Chicago	80, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts applied on carload business.

Large Rivets
(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90
F.o.b. Chicago	3.00

Small Rivets
(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

CHICAGO

Further Curtailment in Output Believed to Bring Upturn in Steel Nearer

CHICAGO, July 1.—Review of steel demand in the first six months of 1930 reveals conditions not far different from the situation in the first half of 1928. A rather sharp switch in demand from one product to another is apparent, and the recession in output at the midyear has come less abruptly than it did two years ago. The outlook for the immediate future is somewhat clouded by business influences outside of the immediate iron and steel market, but there is in evidence crystallization of thought which pictures a stronger and a more active market at the end of the summer months.

The trade views mass vacations and midsummer shutdowns as checks on production, which assist in the liquidation of products already manufactured and which tend to establish a dam, back of which there are accumulating conditions which make for a wider market.

Output at local steel mills will not be above 50 per cent of capacity this week because of the holidays. The rebound next week may not carry production fully back to the 68 per cent average of the past seven days. In fact, a July demand which will not equal that of June seems to be foretold by the action of one producer in blowing out a furnace a short time before the holidays. Twenty steel works stacks are now blowing out of 36 in the district.

Many manufacturers are closing down for two weeks, affording vacations to employees. Most production units of local steel mills will be down over the week-end. Plate mills, which are hard pressed for deliveries to pipe manufacturers, are exceptions.

Orders taken for large diameter pipe in June by the A. O. Smith Corporation amounted to 772 miles, or 100,000 tons.

Pig Iron.—Shipments of Northern foundry iron have fallen off sharply, a situation which is common at this time of the year. Many foundries will be idle during the first week or 10 days of this month. Shipping instructions for the last half of July indicate that total deliveries in July may not equal the aggregate in June, which was close to the lowest point so far this year. Southern iron is being freely offered at $12 a ton, Birmingham, and silvery schedules are no stronger than a week ago. In fact, silvery is selling in the lower grades at 60c. to $1 a ton below current quotations. Northern furnaces that are in blast and producing at a low rate are two Iroquois, the two Federal and the one at Duluth.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$18.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.50
Malleable, not over 2.25 sil.	18.00
High phosphorus	18.00
Lake Super. charc'l, sil. 1.50	27.04
S'th'n No. 2 fdy.	$18.01 to 18.51
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	27.29
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—A boat loaded with English spiegeleisen docked last week at Detroit, where part of its cargo was unloaded. The remainder of the tonnage is now being unloaded at a Chicago dock.

Sheets.—The sheet market is unusually quiet this week. The rate of consumption will be low until after the Fourth of July, and use may also be light for several weeks after that date because of arrangements for mass holidays and inventory periods at many consuming plants. One producer in this district did not resume operations on Monday and will not operate until the Sunday turn at the end of the week. This is a reflection of the character and size of orders as well as a less active demand for immediate shipment. New orders, though individually small and from widely scattered sources, are reaching mills, and it is possible that they will back up in sufficient tonnage so that the second week in July will find output again at 50 per cent of capacity or above.

The foundation for stable prices has not yet been laid. Common quotations at Chicago mills are 2.10c. a lb. for No. 10 blue annealed sheets, 2.65c. for the one-pass product and 3.25 to 3.30c. for galvanized sheets. Deliveries are prompt on all finishes. Roofing sheets may be had from stock.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.70c.; No. 24 galv., 3.30c. to 3.35c.; No. 10 blue ann'l'd, 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
30 to 500 tons	2.00c.
500 tons and over	1.85c.
Rail steel reinforcement	1.65c. to 1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.35c.
Flats and squares	3.85c.
Bands (¼ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes (⅜ in. and larger)	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60 and 10
Carriage bolts	60 and 10
Coach or lag screws	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb	$3.45
Com. wire nails, base per keg	$2.30 to $2.75
Cement c't'd nails, base per keg	2.30 to 2.75

Cast Iron Pipe.—Small orders and inquiries for less than carload lots continue to hold the stage in the cast iron pipe market. Much of this class of business is coming from municipalities, although in the last week or 10 days public utilities have been more in evidence in making small purchases.

The Glamorgan Pipe & Foundry Co. has taken 200 tons of 4 to 16-in. pipe for Chicago, and the Central Foundry Co. has received a formal order for 370 tons for Saint Paris, Ohio. Saginaw, Mich., has taken bids on 150 tons, and Adams, Neb., will open bids July 7 on 150 tons of 2 to 8-in. pipe. Sturgis, Ky., is receiving tenders on 250 tons.

Foundry books are in such shape that deliveries are prompt on most sizes. Prices for 6-in. and larger diameters are steady at $37 to $38 a ton, Birmingham. The freight rate to Chicago is $8 a ton.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45 to $46; 4-in., $48 to $49; Class A and gas pipe, $3 extra.

Rails and Track Supplies.—Standard-section rail rolling schedules are practically at an end, and operations by these units are at the low point of the year, a situation which is usually expected by the first part of July. In years past rail mill operators expected to take time in the summer months for extensive repairs. The spread of rail deliveries this year, with resultant uniformity in deliveries, has put less strain on mills, and it has been possible to keep them in better physical condition. The result is that the midsummer maintenance period is no longer an absolute requirement. New buying is at a standstill, and there are as yet no indications of a secondary buying movement.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Warehouse Business.—The common wire nail market is seeking bottom, with current offerings at $2.30. Movement from local warehouses is steady, but in low volume.

Wire Products.—Prices for wire nails are weak in territory served by

several producers. This is especially the case to the west and southwest of Chicago. Demand for wire by manufacturing trade remains spotty and in small volume. Jobbers are reporting satisfactory distribution of seasonable goods.

Low prices for farm products are causing much speculation as to the future of the wire and wire products trade, some believing that mechanical equipment recently put on farms has cut costs and that the buying power of the farmers will be curtailed less than indicated by the present low level of prices for grain. Low copper prices have had only moderate effect on purchases of electrical cable. Radio manufacturers still are hesitant in making commitments on magnet wire for use later in the summer. Wire mills will curb output during the holidays at the end of the week.

Bars.—Specifications for mild steel bars remain spotty, though there are indications that interest among users is growing. Many major consuming industries shut down over the week-end holiday and will take inventory. Prices for mild steel bars are steady at 1.75c. to 1.85c. a lb., Chicago.

Little is being offered in the way of encouragement for an increased use of alloy steel bars. The farm implement group is operating at the low point of the year and automobile manufacturers are still moving down the scale of output.

The rail steel bar market is drifting. The leading users are manufacturers of barn equipment. Prices show moderate steadiness at 1.75c. a lb., Chicago Heights.

Plates.—Although most rolling mill units will be down for the week-end, Chicago plate mills will suspend only for the minimum time and will resume production to meet the pressure for steel for the manufacture of welded pipe. Other sources of plate demand are quiet. A Western oil producer will buy 1000 tons of plates for tank construction. Like inquiries which are already before the trade call for 10,000 tons. New oil lines require storage tanks at booster stations, and local mills are expecting to participate in a round tonnage of this business. The railroad car market is dull.

Structural Material. — Structural awards and inquiries still show Chicago to be a dull spot. Lettings total 5000 tons and fresh inquiries are for not less than 4500 tons. Projects which have been before the trade for some time, but still considered alive, will take close to 50,000 tons of steel. Pressure against fabricators for lower prices is insistent. Bids for the structural steel for the Lane Technical High School, Chicago, have been thrown out and new figures on the 6000 tons needed will be taken.

Small and medium-sized shops in Chicago and the immediate vicinity are operating between 40 and 50 per cent of capacity. Large fabricators are faring better.

With further curtailment in steel and pig iron output and holiday shutdowns, the immediate outlook is in doubt, but upturn is believed to have been brought nearer.

* * *

Steel output this week, with holiday shutdowns, will not be above 50 per cent of capacity.

* * *

Many steel consuming plants are closing down for two weeks, affording vacations for employees.

* * *

Pig iron shipments have fallen sharply.

* * *

Scrap market thought to be in speculative zone.

Reinforcing Bars.—A gradual outcropping of inquiries, some of which are tardy in developing into contracts, now reaches a total of over 8000 tons. Much of this is considered alive by the trade. School work alone is impressive at close to 2000 tons. One or two apartment projects are out for figures, but on the whole this class of work, which is usually an important factor at this time of the year, is very quiet. A medical unit for the University of Illinois has been awarded, and not far from 2000 tons of miscellaneous highway and bridge work has been placed throughout Illinois. Prices remain on a somewhat unstable basis.

Hot-Rolled Strip. — Tonnage lots are moving at 1.85c. to 1.90c. a lb., Chicago, for widths 6 in. and narrower. Output up to the holidays ranges from 55 to 60 per cent of capacity, which is an improvement over the rate at the middle of June. This situation appears to be only a flash which will not be sustained in nearby weeks.

Bolts, Nuts and Rivets.—Most manufacturers of these commodities are down for the holidays and are taking inventories. Stocks in the hands of producers are in general well rounded, but not of excessive size. Farm implement manufacturers are now studying requirements for August and September.

Coke.—Shipments have fallen sharply in accordance with curtailed melt in local foundries. The price of by-product foundry coke is steady at $8 a ton, f.o.b. local ovens.

Old Material.—The scrap market is stagnant. Quotations on heavy melting steel are nominal at $12 to $12.50 a gross ton, delivered. It has been several weeks since a sizable tonnage has been taken by a mill.

Mills are now well fortified, particularly since they are faced not only with curtailed operations this week, which will include two and in some cases three holidays, but also with shrinking order books, which in the present state of affairs foretell lower average operations in July. There is anticipation of this situation by hold-up orders that are being issued this week.

Railroad lists as a rule are smaller than at the end of May. Industrial plants, operating part time, are producing little and are in some cases storing scrap rather than accept current prices. Yard operators are inclined to take a speculative view of the market rather than prepare grades for sale at current prices. In some cases yards are finding it difficult to obtain supplies, as in the case of sheet scrap for hydraulic bundles. A brighter side of the market is taken by a few brokers, who point to the fact that trade has been at almost a dead level for several weeks and they assume that present prices are very close to the bottom.

The New York Central Lines have issued several blank lists, and the Pennsylvania is offering 50,000 tons. The Chicago & North Western will sell 4000 tons.

Prices deliv'd Chicago district consumers:

	Per Gross Ton	
Basic Open-Hearth Grades:		
Heavy melting steel	$12.00 to	$12.50
Shoveling steel	12.00 to	12.50
Frogs, switches and guards, cut apart, and misc. rails	13.00 to	13.50
Hydraul. compressed sheets	10.50 to	11.00
Drop forge flashings	8.50 to	9.00
No. 1 busheling	9.50 to	10.00
Forg'd cast and r'l'd steel carwheels	15.00 to	15.50
Railroad tires, charg. box size	15.50 to	16.00
Railroad leaf springs cut apart	15.50 to	16.00
Acid Open-Hearth Grades:		
Steel couplers and knuckles	13.50 to	14.00
Coil springs	16.00 to	16.50
Electric Furnace Grades:		
Axle turnings	11.25 to	11.75
Low phos. punchings	13.00 to	13.50
Low phos. plates, 12 in. and under	13.00 to	13.50
Blast Furnace Grades:		
Axle turnings	9.50 to	10.00
Cast iron borings	8.00 to	8.50
Short shoveling turnings	8.00 to	8.50
Machine shop turnings	6.25 to	6.75
Rolling Mill Grades:		
Iron rails	13.00 to	13.50
Rerolling rails	14.50 to	15.00
Cupola Grades:		
Steel rails, less than 3 ft.	13.75 to	14.25
Steel rails, less than 2 ft.	14.50 to	15.00
Angle bars, steel	13.25 to	13.75
Cast iron carwheels	13.50 to	14.00
Malleable Grades:		
Railroad	13.50 to	14.00
Agricultural	12.25 to	12.75
Miscellaneous:		
*Relaying rails, 56 to 60 lb.	23.00 to	25.00
*Relaying rails, 65 lb. and heav.	26.00 to	31.00
	Per Net Ton	
Rolling Mill Grades:		
Iron angle and splice bars	12.75 to	13.25
Iron arch bars and transoms	13.50 to	14.00
Iron car axles	24.00 to	24.50
Steel car axles	15.00 to	15.50
No. 1 railroad wrought	10.00 to	10.50
No. 2 railroad wrought	10.75 to	11.25
No. 1 busheling	7.50 to	8.00
No. 2 busheling	6.00 to	6.50
Locomotive tires, smooth	14.50 to	15.00
Pipes and flues	8.00 to	8.50
Cupola Grades:		
No. 1 machinery cast	12.00 to	12.50
No. 1 railroad cast	10.25 to	10.75
No. 1 agricultural cast	9.50 to	10.00
Stove plate	9.50 to	10.00
Grate bars	8.50 to	9.00
Brake shoes	8.50 to	9.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

NEW YORK

Pig Iron Melt Low—Week's Sales 8000 Tons—Steel Prices Irregular

NEW YORK, July 1.—With many foundries closed for inventories, pig iron melt is very low. Nevertheless, there are indications here and there among jobbing plants that castings orders have improved. Foundries serving industries making equipment for pipe lines are very busy. The Worthington Pump & Machinery Corporation has entered the market for 750 tons for its Harrison, N. J., plant. Sales, at 8000 tons, compare with 7000 tons in the previous week and 9000 tons two weeks ago. The A. P. Smith Mfg. Co., East Orange, N. J., has bought 600 tons and another New Jersey melter has closed for 1000 tons. The Eastern Malleable Iron Co., Naugatuck, Conn., is in the market for 1200 tons of malleable. At least 2000 tons of the iron bought in New York in the past week was for delivery outside of this district.

Prices are substantially unchanged, and pig iron production is being curtailed in preference to selling at further concessions. Furnaces in blast have been slowed down, and it is probable that a number of stacks will be blown out. In fact, the Port Henry, N. Y., furnace will be put out this week. Blast furnace stocks are rather large, those of one producer totaling 90,000 tons and those of another 60,000 tons.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91
*Buff. No. 2, del'd east. N. J.	19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	19.89

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Reinforcing Bars.—Lettings are light, but several large new projects have come into the market. A local warehouse for Montgomery Ward & Co. will take 1000 tons, a vehicular tunnel connecting with the new Hudson River bridge will call for a similar tonnage, and the main approach ramp for the bridge will involve considerable reinforcing steel.

Concrete bars in 40, 50 and 60-ft. lengths for mill shipment are quoted at 1.75c. to 1.85c. a lb., base Pittsburgh. Warehouse prices range from 2.44c. a lb., f.o.b. cars, New York, for carloads or larger lots to 3.25c. for the smallest tonnages.

Finished Steel.—Of outstanding interest this week were the bids submitted to the New York Central on its quarterly steel requirements. A surprising feature of the bids was that the Carnegie Steel Co. and the Jones & Laughlin Steel Corporation put in prices for six months' coverage, the former bidding 1.75c., Youngstown, and 1.85c., West Seneca, N. Y., on plates, shapes and bars, while Jones & Laughlin bid 1.70c., Youngstown, on these prducts. The Bethlehem Steel Co.'s price was 1.80c., West Seneca. The American Rolling Mill Co. was low bidder on blue annealed sheets, with quotations of 1.90c., Middletown, Ohio, on No. 10 gage and 2.05c. on No. 13 gage. Minimum black sheets quotations were 2.55c., with some as high as 2.70½c.

Open market quotations on sheets are often subject to concessions. While 2.55c., Pittsburgh, is the nominal quotation on black sheets, sales are being made at figures $1 and $2 a ton lower. Galvanized sheets are generally 3.10c. to jobbers and 3.15c. to consumers. Blue annealed sheet prices are irregular, 2c. on No. 10 and 2.15c. on No. 13 being obtained only on the smallest orders. Plates are now quite uniformly quoted by Eastern mills at 1.75c., Coatesville, Pa., but some mills will offer concessions on desirable tonnage.

Cast Iron Pipe.—Although buying continues limited to small lots of pipe to complete current contracts, operating rates of Northern foundries are still at 65 to 75 per cent of capacity, and prices are being maintained with little shading. The Westchester County Sewer Commission has taken bids on about 2500 tons of pipe. The Consolidated Railways Co., Havana, Cuba, has closed on 700 tons of pipe with an interest in the United States.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $39.90 to $40.90; 4-in. and 5-in., $42.90 to $43.90; 3-in., $49.90 to $50.90. Class A and gas pipe, $3 extra.

Warehouse Business.—Effective June 26, warehouses have reduced plates, shapes and bars to 3.10c. a lb., base, hoops to 3.75c., bands to 3.40c., blue annealed sheets to 3.40c., black sheets to 3.90c. and galvanized sheets to 4.25c., base. Prices of machine and carriage bolts lack strength, and the former discounts of 60 per cent off on small sizes and 50 to 50 and 10 per cent off on large have been rather generally supplanted by 65 per cent off list. In revising steel prices, jobbers have changed the quantity differential. The present quotations apply on 400 to 3999 lb. of material, while on less than 400 lb. there is an extra of 50c. per 100 lb. Orders for 4000 to 7999 lb. are subject to a reduction of 15c. per 100 lb.; 8000 to 14,999 lb., 25c. reduction, and 15,000 lb. or more, a 40c. reduction.

Coke.—Demand for furnace coke is small, but prices are generally unchanged at $2.50 to $2.60 a net ton, Connellsville, with occasional carload lots obtainable at $2.40.

Special brands of beehive foundry coke, $4.85 a net ton, ovens, or $8.56 delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn; by-product foundry coke, $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Old Material.—Although No. 1 heavy melting steel is being sold to consumers in eastern Pennsylvania in small lots at $12.50 a ton, delivered, a Pencoyd, Pa., consumer having bought a tonnage last week, dealers in New York continue to offer $12.50, delivered, to fill contracts. This is necessitated by the fact that $10.50, New York, equivalent to about $14, eastern Pennsylvania, is being paid for barge shipment to Buffalo mills.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$9.00 to	$10.50
Heavy melting steel (yard)	5.75 to	6.25
No. 1 hvy. breakable cast	7.75 to	8.50
Stove plate (steel works)	6.00 to	6.50
Locomotive grate bars	6.00 to	6.50
Machine shop turnings	5.00 to	5.50
Short shoveling turnings	5.00 to	5.50
Cast borings (blast fur. or steel works)	5.50 to	6.00
Mixed borings and turnings		5.00
Steel car axles		17.00
Iron car axles	19.50 to	20.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	7.75 to	8.25
Forge fire		8.00
No. 1 railroad wrought	10.00 to	10.50
No. 1 yard wrought, long	9.00 to	9.50
Rails for rolling	9.50 to	10.00
Stove plate (foundry)		7.50
Malleable cast (railroad)	10.50 to	11.00
Cast borings (chemical)	9.00 to	9.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$14.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	12.00
No. 2 cast (radiators, cast boilers, etc.)	11.50

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10)	3.40c.
Black sheets (No. 24*)	3.90c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65
1 x 30 in. and smaller	65
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65
¾ x 20 in. and smaller	65
Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

PHILADELPHIA

Prompt Shipment Orders Require Steady Mill Operations

PHILADELPHIA, July 1.—Operating rates of eastern Pennsylvania steel mills are generally 55 to 60 per cent of capacity, but suspensions this week are in most cases only for the holiday period. Steady operation is necessitated by the fact that most of the current buying is in small lots of material for prompt delivery. Although prices are generally lacking in firmness, concessions are only occasionally granted, as the great majority of transactions are small lots of a carload or less. Two of the three leading radio manufacturers in this district have been buying material in preparation for their season of production and are employing more workmen.

The Eastern Steamship Co. is understood to have awarded the contract for two vessels requiring a total of 8000 tons of plates, shapes and bars, to the Newport News Shipbuilding & Dry Dock Co. Other ships on which bids are being taken are for the Oriental Steamship Co., Quaker Line and the Moore & McCormack Co. Plans are being prepared by a Cuban-American interest for two large steel car floats.

Pig Iron.—Eastern Pennsylvania furnaces are still quoting $19 a ton, base, for foundry iron, which is fairly well maintained on the small tonnages which make up most of the present buying. On desirable business, however, the silicon differential is occasionally waived. Foundry iron inquiries in the market at present range from a carload to about 500 tons. The Panama Canal Commission, Washington, opens bids July 16 on 150 tons of low phosphorus pig iron and 30,000 lb. of 10 per cent ferrosilicon.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.		$19.76
East. Pa. No. 2X, 2.25 to 2.75 sil.		20.26
East. Pa. No. 1X		20.76
Basic (del'd east. Pa.)	18.75 to	19.00
Malleable		21.25
Stand. low phos. (f.o.b. east. Pa. furnace)		24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to	24.00
Va. No. 2 plain, 1.75 to 2.25 sil.		22.29
Va. No. 2X, 2.25 to 2.75 sil.		22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—It is generally conceded that substantial orders would bring out concessions from 1.75c. a lb., Pittsburgh, or 2.04c., delivered Philadelphia, but as current buying is limited to carload lots and less, sellers find no occasion to grant concessions.

Reinforcing Bars.—A culvert in Upper Darby, Pa., being built by Delaware County, requires about 800 tons of bars, and a building at Jackson, Water and Swanson Streets, Philadelphia, calls for upward of 250 tons of bars. Other reinforced concrete projects are small. Prices continue at 1.80c. to 1.85c. a lb., Pittsburgh, or 2.09c. to 2.14c., delivered Philadelphia, for billet steel bars, with the extra for cutting to length usually omitted. Rail steel bars range from 1.65c. to 1.70c. per lb., Franklin, Pa., or 1.94c. to 1.99c., delivered Philadelphia, with no extra for cutting to length or bending.

Shapes.—Mills are operating at 55 to 60 per cent of rated capacities, but prices continue lacking in firmness at 1.70c. to 1.75c. a lb., f.o.b. nearest mill to consumer, or 1.76c. to 1.81c., delivered Philadelphia. Desirable tonnages occasionally bring concessions from 1.70c., mill.

Plates.—With the greater part of present buying limited to lots of a carload of plates or less, 1.75c. a lb., Coatesville, Pa., or 1.85½c., delivered Philadelphia, is being maintained. Demand is well distributed among various types of consumers, but with individual orders small the total business being booked is barely sufficient to maintain current operating rates.

Sheets.—A radio manufacturer in Camden, N. J., preparing to enter into production, has closed on small lots of sheets and is employing more workmen. A leading Philadelphia radio interest is also preparing for a season of production, and electrical equipment makers have recently shown increased activity. Other sheet users in this district continue to operate at low rates. Blue annealed sheets, No. 13 gage, are quoted at 2.15c. a lb., Pittsburgh, or 2.44c., delivered Philadelphia, and blue annealed plates, No. 10 gage, are 2c., Pittsburgh, or 2.29c., delivered Philadelphia. Concessions of $2 a ton are usually granted to preferred buyers. Black sheets are quoted at 2.55c., Pittsburgh, or 2.84c., Philadelphia, but with buying limited to less than carload lots there has been no adequate test of the firmness of this price. Galvanized sheets range from 3.15c. to 3.20c., Pittsburgh, or 3.44c. to 3.49c., Philadelphia, in a quiet market.

Imports.—In the week ended June 28, 171 tons of pig iron arrived at this port from Norway and 300 tons of spiegeleisen from Germany. Steel imports consisted of 1023 tons of structural shapes from Belgium and 25 tons of steel billets and 19 tons of bearing tubing from Sweden.

Old Material—A mill at Pencoyd, Pa., has closed on a small tonnage of No. 1 heavy melting steel at $12.50 a ton, delivered. Recent sales of other grades of scrap have been small, but were at slight reductions from previous prices and the trend of prices still appears to be downward. On certain grades, however, such as machine shop turnings and blast furnace scrap, further price reductions will bring the material below the level at which a scrap dealer can profitably collect it.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$12.50 to	$13.00
No. 2 heavy melting steel		10.50
Heavy melting steel (yard)		10.25
No. 1 railroad wrought	15.00 to	15.50
Bundled sheets (for steel works)		9.50
Hydraulic compressed, new	11.00 to	11.50
Hydraulic compressed, old		9.50
Machine shop turnings (for steel works)		9.00
Heavy axle turnings (or equiv.)	11.50 to	12.00
Cast borings (for steel works and roll. mill)	8.75 to	9.00
Heavy breakable cast (for steel works)	11.50 to	11.75
Railroad grate bars		10.00
Stove plate (for steel works)		10.00
No. 1 low phos., hvy., 0.04% and under		20.00
Couplers and knuckles	17.50 to	18.00
Rolled steel wheels	17.50 to	18.00
No. 1 blast f'nace scrap	8.50 to	8.75
Wrot. iron and soft steel pipes and tubes (new specific.)	12.00 to	12.50
Shafting	18.00 to	18.50
Steel axles	21.00 to	21.50
No. 1 forge fire		12.00
Cast iron carwheels	14.50 to	15.00
No. 1 cast	13.00 to	13.50
Cast borings (for chem. plant)	13.50 to	14.00
Steel rails for rolling	13.50 to	14.00

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.60c.
Structural shapes	2.60c.
Soft steel bars, small shapes, iron bars (except bands)	2.70c.
Reinforc. steel bars, sq., twisted and deform	2.60c. to 2.70c.
Cold-fin. steel, rounds and hex	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.25c.
Steel bands, No. 12 to ¼-in. inclus.	3.00c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.70c.
†Galvanized sheets (No. 24)	4.25c.
Light plates, blue annealed (No. 10)	3.15c.
Blue ann'l'd sheets (No. 13)	3.30c.
Diam. pat. floor plates, ¼-in.	5.30c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

To Exact $5 a Car Penalty For Rejected Scrap

The Donner plant of the Republic Steel Corporation at Buffalo has notified scrap dealers and brokers with whom it does business that, effective July 1, a penalty of $5 a car will be charged for all rejected cars of scrap.

Great Lakes Steel Corporation, subsidiary of the National Steel Corporation, has received at its new plant at Detroit two hot-metal cars of 110 tons capacity each. These "thermos" cars will be used for hauling molten pig iron from the Hanna blast furnaces, located near the Great Lakes plant.

CLEVELAND

Despite Some Gains in Steel Orders, Tendency Is Downward

CLEVELAND, July 1.—While some of the mills have benefited by a slight spurt in orders the past week from consumers who placed steel for July requirements, the general tendency of the market is downward. More business was booked in June than in May by some of the mills making the heavier rolled steel products, but orders have continued to decline with producers of sheets and strip steel who cater largely to the automotive industry. A number of Ohio sheet mills have shut down this week for the holiday.

The Otis Steel Co. has entirely discontinued operation except its blast furnaces and coke plant, but will resume partially next week. This company has been operating four open-hearth furnaces and, with the closing down of these and one furnace by another Cleveland steel plant, there are only nine of 34 open-hearth furnaces now operating in Cleveland, or 26 per cent of ingot capacity.

Many metal-working plants will shut down for two weeks during the month, and these suspensions, together with the shutting down for two weeks' period by some of the automobile plants and curtailment by auto parts makers, indicate that the demand for and production of steel this month will be materially reduced as compared with June. While some improvement is looked for in August, the outlook for the latter part of the quarter is not regarded as very promising. However, as consumers' stocks are very low any improvement in plant operations would be reflected quickly in orders for steel.

On structural shapes and plates, 1.65c., Pittsburgh, has become an open market quotation, and concessions to 1.70c., Cleveland, on steel bars are reported. Concessions of $2 a ton to 3.70c. are also reported on fender stock.

Pig Iron.—Cleveland furnaces have reduced prices on foundry and malleable iron 50c. a ton to $18, furnace, effective June 27. While no official price reduction was made for outside shipment, the outside market shows a lower tendency. Local furnaces have been asking $18 for outside shipment, but this has been shaded and it would be necessary for these furnaces to go to $17.50 to absorb freight rates and meet competition at a number of points. Prices in Michigan are easier, reflecting the recent decline in Chicago. In western part of the State $18 is now quoted, a decline of 50c. a ton, and in eastern Michigan there is a spread of $18.50 to $19, the higher price having recently been the prevailing quotation. While prices are unchanged in western Ohio and northern Indiana at $18 to $18.50, the higher price has about disappeared.

Inquiries and sales are light. One producer sold 6000 tons during the week and others small amounts. Most foundries are buying only in small lots for early needs. Inquiries include 500 tons from the General Electric Co. for its Erie works and several 100 to 200-ton lots for northern Ohio foundries. June shipments fell below those of May. One leading producer shipped 10 per cent less iron than during the previous month.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25		$18.00
S'th'n fdy., sil. 1.75 to 2.25.	$18.51 to	19.51
Malleable		18.00
Ohio silvery, 8 per cent...	25.50 to	26.50
Basic Valley furnace.....		18.50
Stand. low phos., Valley...	26.50 to	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

Iron Ore.—Some of the independent steel companies recently curtailed shipping schedules from their own mines. The movement continues slow, and it is expected that shipments this season will not exceed 50,000,000 tons.

Coke.—Some contracts have been closed for the third quarter for the better grades of Connellsville foundry coke at $4.85 and for by-product foundry coke subject to a price adjustment for each month.

Semi-finished Steel.—The leading local producer has named for the third quarter the present $31, Cleveland and Youngstown, price for sheet bars, billets and slabs. This interest has taken off an additional open-hearth furnace, now operating four of 14. Specifications are very light.

Strip Steel.—While little new business is coming from the automotive industry, orders for hot-rolled strip from some other sources gained during the week. These were mostly from consumers who have about used up material previously purchased and are buying for their July requirements. Prices are well stabilized at 1.65c., Pittsburgh, for wide strip and 1.70c. for narrow, with $1 a ton more occasionally paid for small lots. Cold-rolled strip is very dull.

Bolts and Nuts.—Demand continues slow from consumers in every field. However, the June volume was about equal to that in May. Prices are being well maintained. Leading makers are operating their plants three days a week or about 50 per cent of capacity.

Bars, Shapes and Plates.—Demand for bars in small lots improved slightly during the week, and some fair orders for structural shapes came out. Structural inquiry is light. General contract for the Board of Education Building, Cleveland, has been placed, and steel for this and the Cleveland Stadium, aggregating 5500 tons, will be purchased shortly. Some mills have not met the 1.65c., Pittsburgh, price on shapes and plates, and the market is represented by a range of 1.65c. to 1.70c. Many of the smaller plate consumers have placed contracts at the higher price. While steel bars are commonly quoted at 1.75c., Cleveland, there have been concessions to 1.70c.

Sheets.—Some of the barrel manufacturers placed fair-sized orders, and there was a moderate amount of scattered buying during the week by consumers in other fields outside of the automotive industry. Demand from the latter field is very light and is expected to be less this month than in June. Placing of orders for a large tonnage for Ford running boards has been deferred. There is little change in the price situation. Concessions to 2.45c. on black sheets have become more common and some of the mills are going to 3.15c. on galvanized sheets.

Wire Products.—Mills claim to be adhering to $2.15 per keg for nails in this territory and are taking some car-lot business at that price. Manufacturers' wire is holding at 2.30c., Cleveland.

Old Material.—With two Cleveland steel plants shut down and taking no scrap, the market is virtually at a standstill. There is still a limited demand for scrap from dealers in the Youngstown district. Prices are unchanged and nominal.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel..	$12.00 to	$12.50
No. 2 heavy melting steel..	11.75 to	12.00
Compressed sheet steel....	12.25 to	12.50
Light bundled sheet stampings	11.00 to	11.50
Drop forge flashings	10.50 to	11.00
Machine shop turnings	8.50 to	9.00
Short shoveling turnings..	10.00 to	10.50
No. 1 railroad wrought...	13.00 to	13.50
No. 2 railroad wrought...	14.00 to	14.50
No. 1 busheling	11.75 to	12.00
Pipes and flues	9.00 to	9.50
Steel axle turnings	12.50 to	13.00
Acid Open-Hearth Grades:		
Low phos., forging crops..	17.75 to	18.00
Low phos., billet bloom and slab crops	18.50 to	18.75
Low phos., sheet bar crops	18.00 to	18.50
Low phos., plate scrap....	18.00 to	18.50
Blast Furnace Grades:		
Cast iron borings	9.00 to	9.50
Mixed borings and short turnings	9.00 to	9.50
No. 2 busheling	8.75 to	9.00
Cupola Grades:		
No. 1 cast	15.00 to	15.50
Railroad grate bars	11.00 to	12.00
Stove plate	12.00 to	12.50
Rails under 3 ft.	18.50 to	19.50
Miscellaneous:		
Rails for rolling	16.25 to	16.50
Railroad malleable	16.00 to	16.50

BOSTON

Pig Iron Market Remains Quiet—Scrap Prices Still Unsettled

BOSTON, July 1.—The pig iron market remains quiet, sales the past week falling under 2000 tons, of which the Mystic Iron Works sold 1100 tons. Buffalo iron is still available at $16 a ton, furnace, for No. 2 plain and No. 2X, and east of Buffalo iron is quoted at the equivalent or less. Rice, Barton & Fales, Inc., Worcester, Mass., is inquiring for 600 tons of fourth quarter iron, and a Connecticut company is still negotiating for 1250 tons of malleable iron. Otherwise, there is little prospective business. A number of New England foundries are shut down or will close July 3 for a week or two.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$20.28 to $21.28
†Buffalo, sil. 2.25 to 2.75	20.78 to 21.78
*Buffalo, sil. 1.75 to 2.25	20.91 to 21.91
*Buffalo, sil. 2.25 to 2.75	21.41 to 22.41
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	22.61
*Ala., sil. 2.25 to 2.75	23.11
†Ala., sil. 1.75 to 2.25	18.75
†Ala., sil. 2.25 to 2.75	19.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Reinforcing Bars.—Billet steel bar sales the past week were less than 1000 tons, and included the following: 175 tons for a Cambridge, Mass., job; 100 tons for a Boston apartment house; 110 tons for a Brookline, Mass., garage; 100 tons for a Providence, R. I., chain store; and numerous small bookings, the largest of which was 60 tons. Nearly 3500 tons is pending, including 2000 tons for a local Post Office. Billet steel bars are quoted as follows: One to 5-ton lots, 3.15c. a lb., base, from stock; six to 99-ton lots, 2.65c.; 100-ton lots and larger, 2.55c. The rail steel bar market is quiet, but gives evidence of coming to life shortly. Such bars are openly quoted at 2.26½c. a lb., base, delivered Boston freight rate points.

Cast Iron Pipe.—Lettings the past week included 115 tons of 10 and 12-in. pipe to the Warren Foundry & Pipe Co. by Lowell, Mass.; 100 tons of 12-in. to the United States Pipe & Foundry Co. by Reading, Mass.; 100 tons of 12-in. to an unnamed foundry by New London, Conn.; and 16,000 ft. of 8 and 10-in. to the French pipe maker by Amherst, Mass., together with numerous small tonnages totaling about 500 tons. Putnam, Conn., will close bids July 3, on 600 tons of 6, 8 and 16-in. pipe, and Wethersfield, Conn., on a round tonnage of 6 and 8-in. Competition for business is keen, and some low prices have been made. For instance, the Lowell, Mass., tonnage was taken at $41.50 a ton, delivered, less 2 per cent discount, which figures back to a little more than $35 a ton at foundry.

Old Material.—Scrap prices remain unsettled, and in many instances are a little lower than a week ago. For heavy melting steel, $9 a ton, on cars shipping point, is the prevailing price, although one broker is paying $9.25 and another $8.85. Quotations on scrap rails have been cut 10c. a ton, while steel mill borings are 10c. to 25c. cheaper. Buying of steel car axles for Pennsylvania delivery and of railroad malleable for Connecticut consumption at higher prices is noted. Mixed borings and turnings were sold at $3.50 to $4.10 a ton, on cars shipping point, the past week. Most current purchases of long bundled skeleton and of forge flashings are at $7.50 a ton on cars, but some business has just been put through for $7 or a little more. A Dorchester dealer has purchased 16 Eagle boats from the Navy Department, and will scrap them. Exporters have covered their requirements, paying $10 a ton, delivered, for heavy melting steel. A boat is here loading 2000 tons of scrap for Japan.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$8.85 to $9.25
Scrap T rails	8.50 to 8.75
Scrap girder rails	7.50 to 7.75
No. 1 railroad wrought	8.10 to 8.50
Machine shop turnings	4.00 to 4.35
Cast iron borings (steel works and rolling mill)	3.90 to 4.00
Bundled skeleton, long	7.00 to 7.50
Forge flashings	7.25 to 7.50
Blast furnace borings and turnings	4.00 to 4.10
Forge scrap	6.50 to 7.00
Shafting	13.00 to 13.50
Steel car axles	16.50 to 17.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	7.00 to 7.50
Rails for rolling	9.00 to 9.25
Cast iron borings, chemical	9.00 to 9.25

Prices per gross ton deliv'd consumers' yards:

Textile cast	$11.50 to $12.00
No. 1 machinery cast	14.00 to 14.50
No. 2 machinery cast	11.00 to 12.00
Stove plate	7.75 to 9.50
Railroad malleable	15.00 to 16.50

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

BIRMINGHAM

Sheet Prices Lower—Some Third-Quarter Pig Iron Contracting

BIRMINGHAM, July 1.—A few of the large users of pig iron have placed contracts for third-quarter requirements and others have covered for only a part of the period. As a whole, the forward buying is lighter than at any time in years. Stove makers and a number of the miscellaneous foundries are holding off until their stocks and unshipped orders have been used up. Those who are renewing contracts are doing so at the $14 base, which was the price for the second quarter. A slowing up in shipping instructions last week is attributed to inventory period for some foundries.

The Tennessee company has blown out its No. 6 Ensley furnace which had been producing recarburizing iron. This leaves a total of 15 active furnaces in the district, the lowest figure since December, 1929. Of this number, seven are on foundry iron, seven on basic and one on ferromanganese.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil	$14.00
No. 1 fdy., 2.25 to 2.75 sil	14.50
Basic	14.00

Finished Steel.—Demand for sheets is improving steadily and the market is expected to be in the midst of its usual active season by July 15. Inquiries indicate buying will be about as heavy as in past seasons. In contrast with the increased demand, prices on sheets have been reduced again to keep them in line with prices elsewhere. Minimum quotations on blue annealed sheets, No. 10 gage, are now 2.15c., a reduction of $1 a ton from last week's quotations. The price range of $1 a ton on galvanized sheets has been removed, and only the minimum figure of 3.35c. is quoted. New business in plates, bars and light shapes gained slightly last week, but it is still below that of three to four weeks ago. Finishing mills operations held their own last week. With the exception of the idle rail mill, operations are considered fairly good for this season.

Two of the larger structural steel fabricating plants are maintaining steady operations, while others have cut down schedules to the lowest point of the year. The shops report a fair run of small orders, under 100

tons, but no large orders. Bar demand is without improvement and the orders booked are small and scattered. Tank builders are finding enough business to keep operations at about normal. Active open-hearths total 14 of 23, the same as last week.

Cast Iron Pipe.—The market is not showing up as strong as pressure pipe manufacturers had expected. The practice of buying for immediate needs only has worked hardships on the plants. Both municipal and industrial demand is less than that of a year ago. Plant operations are about the same. In most cases there will be only a one-day shutdown for the holiday this week. New inquiries include 600 tons for Atlanta. Bids have been opened and awards are pending on two fair-sized projects in Kansas and one in Montana. The project at Dallas, Tex., requiring about 3000 tons of 20 to 36-in. pipe, will be awarded to the United States Pipe & Foundry Co., according to reports. This company has booked an order for 400 tons for Fullerton, Cal. Prices remain at $37 to $38 a ton, base, Birmingham.

Coke.—The beginning of the second half finds less foundry and industrial coke under contract than at any similar period in years. The volume of shipments is off slightly as compared with that of 30 days ago. Prices remain at $5 a net ton, Birmingham.

Old Material.—Steel mill purchases, which have been the chief support of the market this year, are practically at a standstill. Both prices and demand are the lowest in years. Cast grades have been inactive for months.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$12.00
Scrap steel rails	$12.50 to 13.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	20.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	14.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

PACIFIC COAST

Bars and Shapes Reduced $2 a Ton—Large Bridge Inquiry

SAN FRANCISCO, June 28.—(*By Air Mail*)—Although awards were not especially heavy this week, several large lots came up for figures, including 7500 tons of structural shapes for the Aurora Avenue bridge, Seattle, and 4400 tons for the new Ford plant at Richmond, Cal. Important lettings called for 612 tons of shapes for a bridge over the Salinas River, secured by the Moore Dry Dock Co., and 645 tons of cast iron pipe for Fullerton, Cal., booked by the United States Pipe & Foundry Co.

Demand for reinforcing steel bars continues to show some signs of improvement. Awards for the six months of this year totaled 19,715 tons, as compared with 32,501 tons for the first half of 1929. Los Angeles has placed 193 tons with the Blue Diamond Co. Bids were opened this week on 2500 tons for the Ford plant, Richmond, Cal., and on 500 tons for the Aurora Avenue bridge, Seattle. Pending business exceeds 13,500 tons. Prices in the San Francisco district on out-of-stock material remain unchanged at 2.30c., base, on carload lots. Merchant bar prices have been reduced from 2.35c., c.i.f., to 2.25c.

Plate business was limited to two projects in excess of 100 tons. The Western Pipe & Steel Co. took 375 tons for a 30-in. welded steel pipe line for Everett, Wash. This company also was the low bidder on 500 tons for a pipe line for the Salyer Consolidated Mining Co. of California, and on the basis of steel pipe was low bidder on 2027 tons for two siphons at Vale, Ore. The plate price remains unchanged at 2.25c., c.i.f.

Awards of structural shapes totaled 2435 tons, most of the lettings involving lots of less than 100 tons. Bookings during the first half of this year aggregated 69,443 tons, compared with 179,676 tons for the same period in 1929. A feature of the market is the reduction of prices on shapes, which have been firm for many months, from 2.35c., c.i.f., to 2.25c.

Cast Iron Pipe.—The Pacific States Cast Iron Pipe Co. took 329 tons of 10 and 12-in. Class 150 pipe for Olympia, Wash. An award of an additional 425 tons of 16-in. pipe for the same city is expected next week. Long Beach, Cal., placed 133 tons of 4 to 12-in. pipe with D. P. Durham. The Griffith Co. secured 153 tons of 6 and 8-in. pipe for Long Beach. Bids were opened this week on 657 tons of 6 and 8-in. pipe for Los Angeles. Bids will be opened July 7 on 537 tons of 6-in. pipe for Vancouver, B. C.

Warehouse Material.—Movement of out-of-stock material has improved somewhat during the past 30 days. Warehouse quotations on plates, shapes and bars have been advanced; 2.65c., base, now applies on carload business, with 3.30c., base, f.o.b. warehouse, and 3.40c., base, delivered, applying on smaller lots.

Pig Iron Prices Per Gross Ton at San Francisco

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	2.45c. to 2.95c.
Soft steel bars	2.40c. to 2.95c.
Black sheets (No. 24)	3.65c. to 4.30c.
Blue ann'l'd sheets (No. 10)	3.05c. to 3.55c.
Galv. sheets (No. 24)	4.30c. to 4.80c.
Struc. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Canada

More Interest Shown in Pig Iron Requirements

TORONTO, July 1.—Canadian melters are showing more interest in future pig iron requirements. During the week several of the larger consumers entered the market, and, as a result, some fairly large tonnage contracts were closed for delivery to the end of September. While future buying has reached better proportion in the last few days, there is no actual rush on the part of melters to cover. Several who formerly placed contracts have stated their intention to buy on a hand-to-mouth basis for the present. Some improvement was reported in spot sales for the week, with the total about 1800 tons. Inquiries are improving.

While there has been little curtailment in the daily iron melt, it is indicated in some quarters that lower production will become effective within the next month or six weeks unless some revival is evidenced in new business.

Steel mills are completing rail orders, and it is likely that the rail mills will either suspend operations or go on reduced schedules. Locomotive and rolling stock manufacturing plants are busy and are responsible for a large consumption of pig iron. Iron prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	22.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—While some awards have been made in connection with the terminal program at Montreal for the Canadian National Railways, which will involve between 50,000 and 100,000 tons of steel, there is still a considerable tonnage to be placed for this project. In the Montreal district some large business is also in prospect in connection with bridge construction and for new office and industrial buildings. The demand for structural steel in the Toronto district is mostly in small tonnages,

but a few large projects have been announced, with total business pending said to be around 20,000 tons. The demand for steel in the Western provinces is making good progress.

Old Material.—The revision in price lists a week or so ago appears to have had little effect on new business. Mills are still buying from dealers in a small way, but are picking up some tonnages from the railroads. Shipments of steel scrap to Hamilton consumers on new orders and against contracts are at a good level. While a few consumers have placed forward delivery contracts, new business is mostly for immediate requirements.

Dealers' buying prices:

Per Gross Ton

	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	10.00	8.00
No. 1 wrought	9.00	11.00
Machine shop turnings	6.00	5.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.00	6.00
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	4.00	4.00
Steel axles	10.00	13.00
Axles, wrought iron	12.00	15.00
No. 1 machinery cast	....	12.00
Stove plate	....	10.00
Standard carwheels	....	10.50
Malleable	....	10.00

Per Net Ton

No. 1 mach'ry cast	11.00	....
Stove plate	9.00	....
Standard carwheels	10.00	....
Malleable scrap	9.00	....

Detroit Scrap Steady

DETROIT, July 1.—There have been no changes in prices on old material in the district during the past week. The general feeling is that, with the small amount of material to be released during July, there will be no further recessions in prices.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$11.00 to $11.50
Borings and short turnings	7.25 to 7.75
Long turnings	6.00 to 6.50
No. 1 machinery cast	11.25 to 11.75
Automotive cast	13.50 to 14.00
Hydraul. comp. sheets	10.50 to 11.00
Stove plate	9.00 to 9.50
New No. 1 busheling	9.75 to 10.25
Old No. 1 busheling	8.75 to 9.25
Sheet clippings	8.00 to 8.50
Flashings	9.75 to 10.25

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.30c.
Rail steel reinforc. bars	3.15c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin rounds and hex	3.80c.
Squares	4.30c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

CINCINNATI

Pig Iron Consumers Still Buying Only for Nearby Needs—Scrap Dull

CINCINNATI, July 1. — District consumers of pig iron are watching the trend of business and holding purchases to actual needs. Inquiry has disappeared. Sales last week were about 4800 tons, of which 600 tons in small lots went to Southern furnaces. While reports of price concessions on Southern iron are heard, furnace representatives here are adhering to schedules on shipments to Cincinnati. The only sizable order last week came from a southern Ohio consumer for 1000 tons of Northern foundry iron.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.89 to $21.39
Ala. fdy., sil. 1.75 to 2.25	16.69 to 17.69
Ala. fdy., sil. 2.25 to 2.75	17.19 to 18.19
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 17.69
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Coke.—With the foundry melt still less than 50 per cent of normal, shipments on contract are very slow. Despite the quietness of the market, the present price of $10.05 a ton, on by-product foundry coke, delivered in Cincinnati, will prevail during July.

Finished Steel.—Demand for sheets slackened last week to about 40 per cent of capacity, which is the present rate of production. While there is some evidence of increased activity in the radio field, demand from this source has been very spotty. Specifications from automobile manufacturers have slackened still further.

Old Material.—Prices, while steady, are not attracting much material into the market. Shipments are slow and new business practically negligible.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$11.00 to $11.50
Scrap rails for melting	11.75 to 12.25
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.00 to 10.50
Cast iron borings	8.00 to 8.50
Machine shop turnings	7.50 to 8.00
No. 1 busheling	9.50 to 10.00
No. 2 busheling	6.00 to 6.50
Rails for rolling	13.00 to 13.50
No. 1 locomotive tires	13.50 to 14.00
No. 2 railroad wrought	11.00 to 11.50
Short rails	17.00 to 17.50
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	17.50 to 18.00
No. 1 railroad cast	14.50 to 15.00
Burnt cast	8.25 to 8.75
Stove plate	8.25 to 8.75
Brake shoes	8.25 to 8.75
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

YOUNGSTOWN

Suspensions in Automobile Plants Affecting Valley Mills

YOUNGSTOWN, June 30.—Valley steel mills this week are feeling the full effects of July suspension in plants of the large automobile companies. Open-hearth steel making operations are not above 50 per cent and, with the exception of pipe departments, finishing mill activity is no higher. A number of sheet and strip plants are not operating this week, and others are shutting down after two or three days' production because of the holiday Friday. The Mahoning Valley steel industry has not experienced such lean days since 1922.

Third quarter contracting has been exceptionally light, as many consumers still have material coming to them on old contracts, and the weak price situation doesn't stimulate forward commitments. Some companies are unwilling to sign sheet contracts at the prevailing levels for the entire quarter, but one large maker has been willing to protect its customers at the present levels for the full three months. With business at such a low ebb, steel makers are making some effort to forecast the extent of the midsummer lull. Following fortnight suspensions this month, large automobile companies are expected to step up their production again in August, and work on new models will undoubtedly stimulate buying. Activity in other lines shows no marked trends. Makers of steel building materials in the Youngstown area will maintain a fair operation during the summer, but aggregate purchases of all lines, except line pipe, are considerably below normal. Demand for pipe has enabled the Bessemer departments to run at a better rate than usual, and some companies are experiencing the unusual condition of maintaining a higher rate on Bessemer than on open-hearth steel.

Generally speaking, sheet prices have lost little strength in recent weeks. With buying confined almost entirely in small lots, the incentive to make large concessions has been lacking, and mills have had little difficulty in maintaining current figures. On galvanized sheets irregularities have been more numerous in outside territory, and a price of 3.15c., Pittsburgh, is gaining ground. Black sheets are holding fairly well at 2.55c., while light plates and blue annealed sheets are maintained at 2c. and 2.15c., respectively. On bars the quotation of 1.75c., Pittsburgh, has given way and attractive tonnages are going at 1.70c., and occasionally at 1.65c. However, the latter price is more common in the East than in the immediate Youngstown territory. Strip steel is being maintained at recent low figures, with hot-rolled material quotable at 1.65c. to 1.70c. on the wider sizes, and 1.75c. to 1.80c.

on the narrow. On cold-rolled strip most of the tonnage is going at 2.45c., Pittsburgh. Nail prices are being shaded $1 a ton, but manufacturers' wire is unchanged at 2.30c., Pittsburgh.

The pig iron market is still exceptionally dull, but prevailing furnace quotations are unchanged. Large buyers freely admit that they might easily place attractive tonnages at lower figures than $18.50, Valley, for foundry and basic iron, and $19 for malleable and Bessemer, but most of them are pursuing the usual policy of buying only in carload lots for immediate consumption. Scrap prices are also rather soft, but desirable material is not plentiful and dealers are not anxious to sell substantial tonnages at around the prevailing $15 level.

ST. LOUIS

Third Quarter Pig Iron Buying Held Back—Scrap Prices Still Weak

ST. LOUIS, July 1.—The pig iron market continues quiet. Third quarter buying has not materialized to any extent and may not until after July 15. St. Louis Gas & Coke Corporations's bookings for June nearly approached those of June last year and were approximately 50 per cent ahead of May's. June shipments were about equal to those of May, but were about 25 per cent less than last June. A northern Illinois tractor manufacturer has bought 1700 tons of iron. The local maker has met Chicago competition with a price of $18 in competitive territory.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25 f.o.b. Granite City, Ill.	$18.50 to $19.00
Malleable, f.o.b. Granite City	18.50 to 19.00
N'th'n No. 2 fdy., deliv'd St. Louis	20.16
Southern No. 2 fdy., deliv'd	17.42
Northern malleable, deliv'd	20.16
Northern basic, deliv'd	20.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel.—Buying of plates, shapes, bars and sheets continues at a fair rate. Prices are steady on all items except sheets, in which there is said to be some shading. Specifications from railroads are disappointing in volume. Warehouse business for June is said to be better than that of May and about the same as last June. Structural steel trade is quiet.

Old Material.—The scrap market continues extremely dull, the only purchase of note during the week having been several thousand tons of rails and specialties from several dealers by an East Side mill. No. 1 busheling, which is 50c. a ton lower, and cast-iron borings and shoveling turnings are especially weak, as there are no orders pending for these items. Selected heavy melting steel and miscellaneous standard-section rails are 25c. a ton lower. Railroad springs, rails for rolling, cast-iron carwheels, and agricultural malleable are 50c. down. No. 1 machinery cast declined 75c. Iron rails, iron car axles and railroad malleable are $1 off and wrought iron bars and transoms are $2 lower.

Railroad lists: Chicago, Milwaukee, St. Paul & Pacific, 138 carloads; Missouri Pacific, 107 carloads; Mobile & Ohio, 21 carloads; Nashville, Chattanooga & St. Louis, 15 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$11.25 to $11.75
No. 1 heavy melting or shoveling steel	10.75 to 11.25
No. 2 heavy melting or shoveling steel	10.00 to 10.50
No. 1 locomotive tires	13.00 to 13.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	11.25 to 11.75
Railroad springs	13.25 to 13.75
Bundled sheets	7.50 to 8.00
No. 2 railroad wrought	10.75 to 11.25
No. 1 busheling	9.25 to 9.75
Cast iron borings and shoveling turnings	9.25 to 9.50
Iron rails	10.00 to 11.00
Rails for rolling	12.00 to 13.50
Machine shop turnings	6.00 to 6.50
Heavy turnings	8.50 to 9.00
Steel car axles	15.50 to 16.00
Iron car axles	24.50 to 25.00
Wrot. iron bars and trans.	14.00 to 14.50
No. 1 railroad wrought	8.50 to 9.00
Steel rails, less than 3 ft.	13.50 to 14.00
Steel angle bars	10.25 to 10.75
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	12.00 to 12.50
Railroad malleable	10.50 to 11.00
No. 1 railroad cast	11.50 to 12.00
Stove plate	10.00 to 10.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00
Agricult. malleable	10.00 to 10.50

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb	50

BUFFALO

Operation of Lackawanna Plant Curtailed—Two Blast Furnaces May Go Out Soon

BUFFALO, July 1.—The General Electric Co. is out with an inquiry for 1500 to 2000 tons of foundry and malleable, and there is scattered inquiry for carload and 100-ton lots. Business is very quiet. Aggregate tonnage booked by all the producers is about 3500 tons. It is probable that furnace operation will be curtailed in view of the business slackness. The Lackawanna plant of the Bethlehem Steel Co. may bank one of its four active stacks, and the Hanna Furnace Co. probably will bank one of its three stacks.

Prices per gross ton f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.50
Lake Superior charcoal	27.28

Old Material.—The largest consumer of scrap in the territory has placed a sizable order at $13 for the No. 1 heavy melting steel and $11.50 for the No. 2 steel. Dealers are not interested in buying for yards, which are almost idle.

Prices per gross ton f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$13.00 to $14.00
No. 2 heavy melting scrap	11.50
Scrap rails	12.00 to 12.50
Hydraulic comp. sheets	11.50 to 12.00
Hand bundled sheets	9.00 to 9.50
Drop forge flashings	11.25 to 11.75
No. 1 busheling	11.75 to 12.75
Hvy. steel axle turnings	11.50 to 12.00
Machine shop turnings	8.00 to 8.50
No. 1 railroad wrought	10.50 to 11.00
Acid Open-Hearth Grades:	
Knuckles and couplers	15.00 to 15.50
Coil and leaf springs	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Low phos. billet and bloom ends	17.00 to 17.50
Electric Furnace Grades:	
Short shov. steel turnings	10.75 to 11.00
Blast Furnace Grades:	
Short mixed borings and turnings	9.50 to 10.00
Cast iron borings	9.50 to 10.00
No. 2 busheling	7.00
Rolling Mill Grades:	
Steel car axles	16.50 to 17.00
Iron axles	19.50 to 20.00
Cupola Grades:	
No. 1 machinery cast	12.00 to 12.50
Stove plate	10.75 to 11.00
Locomotive grate bars	9.00 to 9.50
Steel rails, 3 ft. and under	16.00 to 16.50
Cast iron carwheels	13.50 to 14.00
Malleable Grades:	
Industrial	15.50 to 16.00
Railroad	15.50 to 16.00
Agricultural	15.50 to 16.00
Special Grades:	
Chemical borings	11.50 to 12.00

Finished Steel.—The Lackawanna plant of the Bethlehem Steel Co. has reduced its open-hearth operation from 16 to 12 furnaces. The Republic plant is operating three open-

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.20
Black wire, base per 100 lb	3.50

hearths, and operation of other mills is around 60 per cent. A local fabricator was awarded 300 tons of structural steel for an auditorium for St. Lawrence University at Canton, N. Y. Reinforcing bar business is dull, with State roadwork about the only active feature.

Protest Short Haul Rates on Cast Iron Pipe

WASHINGTON, July 1.—Complaint has been filed with the Interstate Commerce Commission by the Florence Pipe & Foundry Co., Florence, N. J., against rates on cast iron pipe and fittings charged on hauls of 500 miles and less. While directed against the Pennsylvania Railroad, which serves the company's plant, the complaint is interpreted as an attack on the mileage scale fixed by the commission itself in the general iron and steel rate case throughout Official Classification territory. It has been observed ever since the decision came down that the rates prescribed on short hauls are unusually high.

The complaint of the Florence Pipe & Foundry Co., filed by Attorney Ernie Adamson, New York, is seen as one of many protests that may be expected to arise from the short haul rates carried in the new mileage scale. Complaint also is made that the rates on cast iron pipe from Florence are unjust and unreasonable to the extent that they are not properly related to the rates from Birmingham when applying within New England and to the so-called metropolitan district of New York and New Jersey. The minimum weight of 40,000 lb. likewise is the object of protest. The complaint asks for rates not to exceed those suggested by the commission in a decision of Dec. 31, 1928. This decision, including several cases, held that rates on cast iron pipe from Florence to destinations east of the Mississippi River were not unreasonable, but were unduly prejudicial to the Florence Pipe & Foundry Co., and unduly preferential of producers at Southern origins. The present complaint of the Florence Pipe & Foundry Co. asks for reparation on shipments which have moved since March 20, when the new rates on cast iron pipe went into effect.

Selling Steel Castings

Need to Consider Usage, to Emphasize Improved Quality, to Have Individual Piece Prices

BY W. H. WORRILOW*

TOO often specifications are hastily scanned or completely ignored when quoting prices, with only the chemical and physical properties receiving consideration, and they, usually broadly interpreted by the foundry or criticized because of their restrictions. The foundry too often overlooks the final use of the casting and the possibility of it being a vital part in a machine upon whose strength and soundness may depend a large money investment or the matter of life or death.

Being called steel castings apparently placed our product in the beginning in the tonnage class, despite their rarely being on a production basis, and unfortunately, a great many foundries continue to consider them in this classification today.

Almost every steel foundryman became obsessed with the idea that he must run his foundry to capacity if he were to make money, and this he was able to do for a few years due to the lack of competition. But with the increase in the number of foundries this policy proved fatal to a great many.

Contribution of World War

The World War created a demand for the highest quality of castings, and when it was over, foundries specializing in such castings realized that there was a field for them and made a special effort to develop it. Their research laboratories were enlarged and investigations of all sorts were conducted.

Groups were formed to act in a cooperative manner for the development of such research, reduction of costs, merchandising of castings, new uses, etc.; and these were successful from the start.

With the improvement in castings came something definite for the salesman to sell. Men were selected for the selling of castings who had shop experience, who were familiar with foundry practice, design of pattern, cost of production, physical and chemical properties, service, etc., and who were able to justify profitable selling prices on the actual costs of individual castings.

With a knowledge of their subject, these men could enthuse over the selling of their castings where the old type of salesman had no source of enthusiasm. They had a story to tell and could tell it in a pleasing and convincing manner. They did not undertake to simply sell steel castings, but they sold definite castings, a casting by name, with the result that they were able to obtain business at prices which yielded a good profit.

Two Selling Principles

Such men became better salesmen with the landing of every order at the price they had set out to obtain. This, in turn, gave them confidence, and it was no task at all for them to continue selling on such a basis; and unless one has known the thrill of securing an order at his own price after a considerable struggle he cannot appreciate such a feeling.

To me the profitable selling of steel castings is based on two principles: those of a fixed price and a price for individual pieces.

It is contended that it takes too much time and too large a clerical force to obtain separate prices on job work. I can tell you from my own experience that it does not, and that we have found it profitable over a period of years to obtain the costs on every pattern; and if you will only do this you will get some pleasant, also unpleasant, surprises.

*President, Lebanon Steel Foundry, Lebanon, Pa. The article is an abridgement of an address before the Steel Founders' Society of America, at White Sulphur Springs, W. Va., June 28.

Steel Furniture and Shelving Sales Show Decline

		May, 1930	April, 1930	May, 1929
Steel furniture,	new orders (a)	$2,313,294(b)	$2,523,746	$2,936,728
do.	do. five months	12,720,839	.....	15,855,052
do.	shipments	2,349,911(b)	2,427,006	2,824,130
do.	do. five months	12,943,902	.....	15,642,788
do.	unfilled orders	1,644,739	1,680,003	2,405,522
Steel shelving,	new orders (a)	725,243(c)	796,100	1,120,990
do.	do. five months	3,844,168	.....	5,381,083
do.	shipments	751,521	814,706	989,120
do.	do. five months	3,735,764	.....	5,100,633
do.	unfilled orders	753,976	782,460	897,361

(a) United States Department of Commerce.
(b) Lowest since last September.
(c) Smallest since last January.

Ayers & Lord Tie Co. has announced its merger with the American Tar Products Co., Pittsburgh, Pa., a Koppers interest. The Ayers & Lord Co. will continue to maintain general offices in Chicago and will be under the same management, with Arthur W. Armstrong president and John D. Lord chairman of the board.

Non-Ferrous Metal Markets

Copper Quiet and Unchanged — Tin Very Dull — Lead Steady—Zinc at New Low

NEW YORK, July 1.

Copper.—Sales of copper are moderate, both for domestic and foreign shipment. Business for the month has been in fair volume, the total sales abroad having been about 29,000 gross tons, which is close to 25 per cent of the record sales in May. Domestic buying has been fair, the total comparing favorably with months in which business has not been very active. During the last day or two in June, sales to wire makers and brass producers were quite heavy, and one large company, at least, will show a reduction in stocks for the month.

It is expected that the statistics for June will show a slight decline in stocks of refined metal and in blister copper, with production of both refined copper and copper ore measurably reduced.

There has been no change in prices, which continue firm at 12c. for electrolytic copper, delivered in the Connecticut Valley, with the quotation of Copper Exporters, Inc., at 12.30c., c.i.f., usual European ports. Lake copper is moderately active at 12c. to 12½c., delivered. In general sales are being made at these prices for delivery through September. Very little metal has been sold beyond August.

Copper Averages. — The average price of Lake copper for June, based on daily quotations in THE IRON AGE, was 12.50½c., delivered, New York. The price of electrolytic copper was 12.09c., refinery, or 12.34c., delivered in the Connecticut Valley.

Tin.—With quotations somewhat higher than the extremely low levels of two weeks ago, buying both by dealers and consumers has almost disappeared. The market could hardly be more stagnant. Supplies of tin continue to pile up, as the following facts clearly show:

The world's visible supply on June 30 was 42,611 gross tons, an increase of 2840 tons over the total on May 31. These data do not include stocks in the Far East. Metal in London warehouses at the end of June amounted to 22,479 tons, an increase of 862 tons over the total on June 21. Both of these totals are the largest in a very long period.

Declines in consumption are emphasized by the fact that American deliveries were very small during June, at only 5885 gross tons, and also that the deliveries for the first half of this year were about 10,000 tons less than for the same six months in 1929. In the face of these conditions production still continues high.

Spot Straits tin was quoted today at 30.05c., New York. In London quotations today were about £1 per ton lower than a week ago, with spot standard quoted at £135 12s. 6d., future standard, at £137 12s. 6d. and spot Straits at £137 17s. 6d. The Singapore price today was £139 7s. 6d.

Lead.—Conditions during the week have changed little. Prices are firm at 5.15c., St. Louis, with the leading interest at 5.25c., New York, as its contract price. Demand is confined to carload and small lots, mostly for nearby delivery, with some sales extending into August. Metal is not available beyond August delivery.

Zinc.—New low levels in the last 10 years for prime Western zinc were reached today, when the quotation fell to 4.10c., East St. Louis, or 4.45c., New York. This is a decline of over 20 points in the last week. On the scale down there has been considerable buying. The weakness is due to large stocks, slackness in demand, and willingness by a few producers to convert metal into cash.

Ore prices are unchanged at $29, Joplin, with sales for the week ended Saturday, June 28, at 7310 tons. With shipments at 8863 tons and production estimated at 9000 tons, the surplus is put at 24,788 tons.

Antimony.—Chinese metal in a dull market is quoted at 7c., duty paid, New York, for spot delivery, with futures at 6.87½c.

Nickel.—Wholesale lots of ingot nickel are quoted unchanged, at 35c. a lb., with shot nickel at 36c. and cathodes of electrolytic nickel at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered, which is 1c. less than the quotation which has prevailed for many months.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	July 1	June 30	June 28	June 27	June 26	June 25
Lake copper, New York	12.12½	12.12½	12.12½	12.12½	12.12½	12.12½
Electrolytic copper, N. Y.*	11.75	11.75	11.75	11.75	11.75	11.75
Straits tin, spot, N. Y.	30.05	30.12½	....	30.75	30.37½	31.00
Zinc, East St. Louis	4.10	4.12½	4.15	4.15	4.20	4.20
Zinc, New York	4.45	4.47½	4.50	4.50	4.55	4.55
Lead, St. Louis	5.15	5.15	5.15	5.15	5.15	5.15
Lead, New York	5.25	5.25	5.25	5.25	5.25	5.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	18.75c.
Copper, hot rolled, base sizes	21.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	24.00c.
Seamless Tubes—	
Brass	23.75c.
Copper	23.75c.
Brass Rods	17.00c.
Brazed Brass Tubes	26.25c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	10.25c. to 10.75c.
Zinc sheets, open	11.25c. to 11.75c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	32.00c. to 33.00c.
Tin, bar	34.00c. to 35.00c.
Copper, Lake	13.75c.
Copper, electrolytic	13.50c.
Copper, casting	13.75c.
Zinc, slab	6.25c. to 7.25c.
Lead, American pig	6.25c. to 6.75c.
Lead, bar	8.25c. to 8.75c.
Antimony, Asiatic	10.00c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	22.25c. to 23.25c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	35.00c.
Tin, bar	37.00c.
Copper, Lake	13.13c.
Copper, electrolytic	13.13c.
Copper, casting	12.75c.
Zinc, slab	6.75c. to 7.00c.
Lead, American pig	6.00c. to 6.25c.
Lead, bar	8.75c.
Antimony, Asiatic	14.00c.
Babbitt metal, medium grade	17.50c.
Babbitt metal, high grade	38.00c.
Solder, ½ and ½	22.25c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	10.00c.	11.00c.
Copper, hvy. and wire	9.75c.	10.75c.
Copper, light and bottoms	8.50c.	9.50c.
Brass, heavy	6.00c.	6.75c.
Brass, light	4.50c.	5.75c.
Hvy. machine composition	8.50c.	9.50c.
No. 1 yel. brass turnings	5.50c.	6.50c.
No. 1 red brass or compos. turnings	7.50c.	8.50c.
Lead, heavy	3.75c.	4.25c.
Lead, tea	2.50c.	3.25c.
Zinc	2.00c.	2.50c.
Sheet aluminum	7.50c.	9.50c.
Cast aluminum	7.00c.	9.00c.

Fabricated Structural Steel

Awards of 33,000 Tons Show Little Change from Previous Weeks—New Projects One of Year's Smallest Totals

STRUCTURAL steel awards of 33,000 tons were at about the same level as for the past four weeks. Included were 3300 tons for a Post Office in Brooklyn, 3000 tons for an apartment building in New York and 1000 tons for a terminal building in Cincinnati. New projects, possibly influenced by the approaching holiday, declined to about 18,000 tons, one of the smallest weeks of the year, from a total of 91,000 tons a week ago. Inquiries include 3500 tons for a 40-story office building in New York, 2800 tons for a warehouse in Toledo, Ohio, and 2100 tons for a bridge in Detroit. Awards follow:

North Atlantic States

GLENS FALLS, N. Y., 365 tons, St. Mary's Church school, to an unnamed fabricator.

BERLIN, VT., 170 tons, theater, to Porcupine Co.

CAMBRIDGE, MASS., 160 tons, school of geography, to an unnamed fabricator.

LOWELL, MASS., 500 tons, Post Office to a Western fabricator.

BROOKFIELD, MASS., 100 tons, Boston & Albany railroad bridge, to Watts Construction Co.

HARTFORD, CONN., 1620 tons, Southern New England Telephone Co. building, to Levering & Garrigues Co.

CANTON, N. Y., 300 tons, auditorium for St. Lawrence University, to Kellogg Structural Steel Co.

NEW YORK, 3000 tons, apartment building, East End Avenue and Eighty-fifth Street, to American Bridge Co.

NEW YORK, 2550 tons, Royal Building, to Taylor-Fichter Steel Construction Co.

NEW YORK, 2050 tons, Astor apartment building, to American Bridge Co.

BROOKLYN, 3300 tons, Post Office, to Taylor-Fichter Steel Construction Co.

CAMDEN, N. J., 400 tons, New York Shipbuilding Co. building, to an unnamed fabricator.

STATE OF MARYLAND, 300 tons, highway bridge, to American Bridge Co.

STATE OF NEW JERSEY, 125 tons, highway bridge at Tuckahoe, to Bethlehem Steel Co.

WHARTON, N. J., 325 tons, storage buildings and conveyors for Alan Wood Mining Co., to McClintic-Marshall Co.

PENNSYLVANIA RAILROAD, 300 tons, bridge at Norwood, Ohio, to American Bridge Co.

ELIZABETH, N. J., 500 tons, building, to Levering & Garrigues Co.

SAFE HARBOR, PA., 1200 tons, work bridge, to Bethlehem Steel Co.

SPEERS RUN, PA., 2000 tons, Monessen River bridge, to American Bridge Co.

The South

SEABOARD AIR LINE, 1495 tons, bridge at Petersburg, Va., to American Bridge Co.

PINEY RIDGE, VA., 1000 tons, chemical plant, to McClintic-Marshall Co.

CULLMAN, ALA., 100 tons, new church, to Ingalls Iron Works.

MEMPHIS, TENN., 385 tons, Post Office and Custom House, to Decatur Iron & Steel Co., Decatur, Ala.

LOWNDES COUNTY, MISS., 115 tons, bridge, to Decatur Iron & Steel Co.

ATLANTA, GA., 138 tons, synagogue, to Decatur Iron & Steel Co.

FELSENTHAL, ARK., 400 tons, bridges over Ouachita River, to Decatur Iron & Steel Co.

Central States

DETROIT, 1000 tons, elevated water tank, to McClintic-Marshall Co.

PONTIAC, MICH., 350 tons, office building for Consumers Power Co., to Flint Structural Steel Co.

HUBBELL, MICH., 500 tons, copper plant, to American Bridge Co.

CINCINNATI, 100 tons for Southern Railway, to Ingalls Iron Works Co.

CINCINNATI, 1000 tons, Cincinnati Union Terminal Co. building, to Mount Vernon Bridge Co.

PITTSBURGH AND WEST VIRGINIA RAILROAD, 1500 tons, Youghiogheny River bridge, to American Bridge Co.

FAIRMONT, MINN., 400 tons, factory for Fairmont Railway Motors, Inc., to Flint Structural Steel Co.

MILWAUKEE, 400 tons, gymnasium for St. Mary's Academy, to C. Hennoche Co., Milwaukee.

FLIETH, WIS., 325 tons, highway bridge, to Wausau Iron Works.

CHESTERVILLE, ILL., 250 tons, highway bridge, to Mississippi Valley Structural Steel Co.

CLINTONVILLE, ILL., 700 tons, highway bridge, to Clinton Bridge Co.

SOUTH CHICAGO, ILL., 200 tons, soaking pit building for Wisconsin Steel Co., to Worden-Allen Co., Milwaukee.

CHICAGO, 230 tons, St. Margaret's School, to Midland Structural Steel Co.

Western States

SALT LAKE CITY, UTAH, 600 tons, high school, to Engineering & Steel Corporation.

TULSA, OKLA., 300 tons, bridge for Frisco Lines, to Capital Steel & Iron Co.

OKLAHOMA CITY, OKLA., 500 tons, service building for Byllesby Engineering & Management Corporation, to J. B. Klein Iron Works.

SEATTLE, 250 tons, barges for Foss Co., to Lake Washington Shipyards.

EVERETT, WASH., 375 tons, 30-in. welded pipe line, to Western Pipe & Steel Co.

HOOPA, CAL., 200 tons, bridge over Trinity River, to Moore Dry Dock Co.

GONZALES, CAL., 613 tons, bridge over Salinas River, to Moore Dry Dock Co.

VALLEJO, CAL., 100 tons, bridge over Sacramento Street, to Moore Dry Dock Co.

BERKELEY, CAL., 150 tons, addition to Philadelphia Quartz Co. plant, to Moore Dry Dock Co.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

EVERETT, MASS., 335 tons for Merrimac Chemical Co.; 200 tons for machine shop unit, and 135 tons for contact building.

CAMBRIDGE, MASS., 129 tons, biology building, Harvard University.

STATE OF MASSACHUSETTS, 400 tons, highway bridges.

NEW YORK, 3500 tons, office building at Fortieth Street and Madison Avenue; Dwight P. Robinson & Co., general contractors.

BROOKLYN, 400 tons, Green Avenue sanitarium.

STATE OF NEW YORK, 1000 tons, highway bridges.

PHILADELPHIA, 1400 tons, school administration building; John McShain, Inc., low bidder on general contract.

Central States

FLINT, MICH., 300 tons, Post Office.

DETROIT, 2100 tons, bridge; Great Lakes Dredge & Dock Co., low bidder on general contract.

INDIANA HARBOR BELT RAILROAD, 750 tons, grade separation in Illinois.

SOUTH BEND, IND., 1250 tons, grade crossing elimination for New York Central Railroad.

TOLEDO, 2800 tons, warehouse.

CHICAGO, 800 tons, Swedish Engineers' Club.

CHICAGO & WESTERN INDIANA RAILROAD, 500 tons, mail building at Chicago.

UNION PACIFIC, 130 tons, I-beam spans.

SPRINGFIELD, ILL., 1500 tons, State highway bridges.

EAU CLAIRE, WIS., 845 tons, interstate bridge between Houlton, Wis., and Stillwater, Minn.; bids close July 22.

Western States

STATE OF OKLAHOMA, 550 tons, highway bridges.

WALLA WALLA, WASH., 175 tons, plates, 20-in. No. 10 gage riveted pipe; bids July 9.

VALE, ORE., 2027 tons, plates, Bully Creek and Fairman Coulle siphons; Western Pipe & Steel Co., low bidder on steel pipe.

SAN FRANCISCO, 500 tons, plates, pipe line for Salyer Consolidated Mining Co.; Western Pipe & Steel Co., low bidder.

Ore Movement to July 1, 29 Per Cent Below 1929

Water shipments of Lake Superior ore during June amounted to 8,650,441 tons, compared with 10,174,424 tons during the same month last year. Shipments for the season to July 1 were 15,737,573 tons, against 22,239,938 tons to July 1, last year.

The decline was 15 per cent as compared with last June and 29 per cent up to July 1.

William H. Bowe, Herrick Co., Boston, was elected president of the New England Iron and Hardware Association at its annual meeting in Boston on June 24, and Clarence C. Dodge, George F. Blake, Inc., Worcester, Mass., became vice-president. Mr. Bowe succeeds Franklin E. Bragg, N. H. Bragg & Son, Bangor, Me., who served as president two years. George J. Mulhall was reelected treasurer and clerk.

Reinforcing Steel

Week Has Been Quiet—Awards About 4500 Tons

LETTINGS of reinforcing steel the past week were light, amounting to about 4500 tons, the largest, 1500 tons, for road work in Illinois. New projects total 5500 tons and include 1000 tons for a warehouse in New York and 1000 tons for a vehicular tunnel connecting with the new Hudson River bridge, New York. Awards follow:

CAMBRIDGE, MASS., 175 tons, candy factory, to Joseph T. Ryerson & Son, Inc.

BROOKLINE, MASS., 110 tons, garage, to Concrete Steel Co.

BOSTON, 100 tons, apartment building, to Kalman Steel Co.

PROVIDENCE, R. I., 100 tons, Kresge store, to a Western bidder.

JERSEY CITY, N. J., 300 tons, pier for Pennsylvania Railroad, to Igoe Brothers.

JERSEY CITY, 200 tons, State highway bridge; placed by Raymond Concrete Pile Co. with Concrete Steel Co.

CLEVELAND, 600 tons, piling for Lorain Central bridge, to Republic Steel Corporation.

SPRINGFIELD, ILL., 1500 tons, road work, to unnamed bidders.

SPRINGFIELD, 400 tons, bridges, to an unnamed bidder.

CHICAGO, 650 tons, medical building for University of Illinois, to Concrete Steel Co.

LOS ANGELES, 193 tons for city, to Blue Diamond Co.

LOS ANGELES, 100 tons, property building for RKO Studios, to Concrete Engineering Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

WOODS HOLE, MASS., 100 tons, Government fisheries unit.

NEW YORK, 1000 tons, warehouse for Montgomery Ward & Co. at Ninth Avenue and Thirty-first Street; Turner Construction Co., general contractor.

NEW YORK, 1000 tons, vehicular tunnel connecting with Hudson River bridge; general contract bids to be taken July 14.

NEW YORK, unstated tonnage, main approach ramp, Hudson River bridge; general contract bids to be taken July 14.

NEW YORK, 200 tons, subway route 106, section 7; DeMarco & Reimann, low bidders on general contract.

UPPER DARBY, PA., 800 tons, culvert for Delaware County.

PHILADELPHIA, 250 tons, building at Jackson, Water and Swanson Streets for Becker, Smith & Page, Inc.

CLEVELAND, 325 tons, warehouse for General Electric Co.; this is in addition to 475 tons previously placed.

BERWYND, ILL., 120 tons, theater.

CHICAGO, 165 tons, lion's house at McCormick Zoo.

CHICAGO, 320 tons, Prudential State Bank building.

CHICAGO HEIGHTS, ILL., 600 tons, high school.

ROCKFORD, ILL., 450 tons, sewage disposal plant.

PHOENIX, ARIZ., 100 tons, hospital addition; bids being taken.

Welding a Large Factor in Airplanes

(*Concluded from page* 22)

satisfactory and uniform results.

Mr. Knerr demonstrates that observation of the following precautions, prior to, during and subsequent to heat-treating operations, will insure the dependability of all metal parts and, aside from dimensional errors in machinery, etc., reduce rejections in final inspection to almost a negligible point:

1. Purchase of metallic materials under adequate specifications, which shall include among other things, chemical tolerance ranges as well as required physical properties. 2. Standardization upon a minimum variety of steels, aluminum alloys and other metals, and upon a minimum variety of physical properties in which each may be received, treated or used. 3. Restriction of each grade of steel to type analysis corresponding with a standard S.A.E. or Army-Navy steel number or the equivalent. 4. Rigorous inspection and test of raw materials to insure that specifications are met and that quality is uniform. 5. Clear and correct identification of each piece of stock in storage and during processing. 6. Detailed process specifications covering the heat treatment of each type of material. 7. Reliable recording pyrometric equipment, frequently checked. 8. Properly designed and operated furnace and quenching equipment. 9. Hardness tests of steel parts after quenching, to determine correct tempering and temperature of all metallic parts following heat treatment to insure that they have responded correctly. 10. Intelligence, care and conscientious attention to instructions on the part of the heat treater. 11. Active technical supervision by a competent metallurgist of heat-treating operations and of other processes which may influence the properties of metal parts and immediate investigation of any failures to determine their cause and prevent their recurrence.

Ford Scraps 375 Automobiles Each 16 Hours

(*Concluded from Page* 15)

All model T engines are conveyed past the washing machine to a group of specially designed presses. These segregate the parts for remelting, according to the metal each contains. As the salvage line serves as an antithesis to an assembly line, the multiple screw presses here used operate in reverse. Two, similar to the many that once tightened model T bolts, work in an opposite direction and so unseat bolts, six at a time, from the face of the transmission on flywheels. Other presses drive the shaft out of the transmission, strip the bushing from the shaft and take the bronze bushings from the clutch. Another forces the bushings out of the drums and gears and another press removes the wrist pin and bronze bushings from the piston.

As the cars brought in by Ford dealers arrive at Dearborn they are deposited in a field near the open-hearth building. Besides present well known makes, the list of arrivals includes many that are reminiscent of other days. Among them are the Apperson, Velie, Bay State, Dort, Case, Maxwell, Scripps-Booth, Jewett, Elgin, Jeffery, Gray, Earl, Columbia, Mitchell, Briscoe, Saxon and many model T Fords.

Steel Merger Suit Halted By Suicide of Counsel

Trial of the injunction suit to prevent the merger of the Youngstown Sheet & Tube Co. with the Bethlehem Steel Corporation came to a tragic halt Friday morning, June 27, when Leroy A. Manchester, general counsel of the Sheet & Tube company, committed suicide in his office shortly before court was to open in the morning. James A. Campbell, chairman of the Sheet & Tube company, was to have been called as the first witness. The trial was postponed to Tuesday, July 8.

8,000 Tons of Steel in Aircraft Carrier

WASHINGTON, July 1.—Approximately 8000 tons of plates, shapes and bars will be required for the aircraft carrier, for which the Navy Department will open bids Aug. 12.

Railroad Equipment

Norfolk & Western will build 500 steel box cars in its own shops.

Bethlehem Steel Co. is inquiring for trucks for five ore cars.

Portland Cement Co. of Mexico is inquiring for 20 gondola cars.

A Machine Tool Builder's Experience

(*Concluded from page* 13)

in its first few years, however, it seems sure of a bright future. The material is being steadily improved and its weaknesses overcome. Six months ago I would have numbered among its disadvantages the non-uniformity of the material and the difficulty of properly brazing it. Today these are relatively unimportant and rarely cause trouble. Milling cutters and drills will be developed further, and machine tools will be designed to take full advantage of the qualities of tungsten-carbide. The material will never be a panacea, however, and judgment should be exercised in introducing it into one's shop."

British and European Wages Compared

Survey Shows Lower Continental Level But No More Modern Mills —Indian Merchants Urged to Withdraw from British Banks

(*By Cable*)

LONDON, ENGLAND, June 30.

THE report just made public by the committee of the British Economic Advisory Council investigating the steel industries of France, Belgium, Luxemburg, Germany and Czechoslovakia absolves British makers from charges of inefficiency. France, Belgium and Luxemburg have no unemployment and Czechoslovakia but little.

For every 100s. ($24.33) paid as wages in Britain, Germany pays 67s. ($16.28), France 50s. ($12.16), Luxemburg 49s. ($11.90), Belgium 57s. ($13.85), and Czechoslovakia 52s. ($12.64).

The report finds Continental employers much freer in making agreements with workers than the British, and no such disparity there as in Great Britain between the wages of skilled, semi-skilled and unskilled workers, and between the earnings of corresponding grades of workers in each department, such as blast furnaces, steel melting shops and rolling mills.

French capacity for production was found to have greatly increased, largely through reparations payments and depreciation of the franc.

Marked evidence is reported of intention to extend capacities further. Belgian modernization of works has resulted in a minimum of employees, which is also a prominent feature of mills in Luxemburg.

Germany, says the report, is feeling serious competition from France, Belgium and Luxemburg, and high interest rates form a heavy burden, while unemployment is serious. The report further says that in efficiency and modernity of equipment, certain British plants are equal to and in some cases better than the Continental.

British Survey of Continental Mills Shows Wage Levels Lower But Less Disparity Between Skilled and Unskilled Labor.

* * *

Merger of British Companies With International Interests Will Manufacture Small, Cold-Starting Diesel Engine.

* * *

Australia Adds New Products to High-Duty List.

* * *

Soviet Union Buys American Design Aircraft Motors from German Licensee.

* * *

Continental Railroads Hold Competition for New Design of Less-Carload Container.

New Company to Make Diesel Engine

Amalgamations in the British steel industry are proceeding and Ruston & Hornsby, Ltd., Lincoln, and R. A. Lister & Co., Ltd., Dursley, have concluded a mutual working agreement, which affects 12 subsidiary, allied and associated companies, including interests in the United States, Canada, France, Belgium, Germany, Australia and Argentina. The joint interests will produce a new, light, high-speed, cold-starting Diesel engine of 25 hp. to 100 hp.

A merger is pending between James Dunlop & Co. and David Colville & Sons, which, it is said, may include shipbuilding interests. Dorman, Long & Co. have arranged to acquire an interest in the Tees Side Bridge & Engineering Works.

The British Steel Work Association is desirous of securing a revision of the obsolete building regulations and is endeavoring to secure a national code regulating steel-framed buildings, the code to be drawn up and enforced by a central authority. This would permit standardization of this class of building.

Thomas W. Ward, Ltd., Sheffield, has acquired the Midland Coal, Coke & Iron Co.'s Apedale plant and properties, presumably for dismantling.

The Bombay Cotton Brokers' Association has resolved to call on Indian merchants to withdraw, July 1, all money deposited in British banks, and is urging Indians to cease dealing with such banks.

The British iron and steel market is generally inactive, with pig iron producers planning further reductions in output. Gjers, Mills & Co. are planning to close their Ayresome works. Two furnaces at Scunthorpe are blowing out with 15,000 tons of pig iron stocked.

Cleveland makers are maintaining prices, but East Coast hematite prices are declining steadily and probably

---

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export	£11	10s.					$55.95	
Billets, open-hearth	6	0	to	6	10		29.20 to	31.63
Black sheets, Japanese specifications	12	5					59.61	
Tin plate, per base box	0	18	to	0	18¼		4.37 to	4.43
							Cents a Lb.	
Steel bars, open-hearth	8	0	to	8	10		1.74 to	1.85
Beams, open-hearth	7	7½	to	7	17½		1.60 to	1.71
Channels, open-hearth	7	12½	to	8	12½		1.66 to	1.87
Angles, open-hearth	7	7½	to	7	17½		1.60 to	1.71
Black sheets, No. 24 gage	9	15	to	10	0		2.12 to	2.17
Galvanized sheets, No. 24 gage	11	17½					2.57	

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£3	2½s.	to	£3	3½s.		$15.21 to	$15.45
Billets, Thomas	4	13	to	4	14		22.63 to	22.87
Wire rods, low C., No. 5 B.W.G.	6	2	to	6	4		29.69 to	30.19
Rails, light	6	0					29.20	
Black sheets, No. 31 gage, Japanese	11	5	to	12	12		54.68 to	58.32
							Cents a Lb.	
Steel bars, merchant	5	7½					1.18	
Steel bars, deformed	5	6½	to	5	7½		1.17 to	1.18
Beams, Thomas, British standard	5	1	to	5	2½		1.11 to	1.14
Channels, Thomas, American sections	5	12	to	5	14		1.24 to	1.26
Angles, Thomas, 4-in. and larger, over ¾-in. thick	5	6					1.17	
Angles, Thomas, 3-in.	5	7½					1.18	
Hoop and strip steel over 6-in. base	5	15					1.27	
Wire, plain, No. 8 gage	6	12½					1.43	
Wire, barbed, 4-pt. No. 12 B.W.G.	10	12½					2.30	
Wire nails, base	6	7½					$1.42 a keg	

£3 10s. ($17.03) would be accepted for desirable lots. Low-priced export contracts for ferromanganese are being completed and makers are generally quoting about £11 10s. ($55.95) per ton, f.o.b., on new business. This is subject to variation, however, according to local conditions.

Australia has bought a few small lots of steel plates, otherwise export steel is quiet. It is believed that domestic and export orders have been withheld awaiting the steel makers' recent decision not to alter prices, but there are no indications as yet of substantial tonnages being released, and heavy mills are operating part time.

The Continental market here is still confused by the various Continental Steel Cartel deliberations and continued uncertainty of the British merchants' position. Distributers not included in Class "A" assert that they are able to buy at less than official prices, but business generally is quiet. In comparison with other steel markets tin plate is moderately active with considerable export inquiries and indications of a substantial demand if the tin market becomes more settled. Makers are accepting 18s. ($4.37) per base box, f.o.b. works port. Galvanized and black sheets are unchanged.

The Clyde shipbuilding output in June was 27 vessels of 90,000 tons, which included the Canadian Pacific liner Empress of Britain.

Europe May Reduce Extra on Open-Hearth Steel

HAMBURG, GERMANY, June 16.—Reduction by German steel mills of the extra on open-hearth steel from 8 m. ($1.90) per ton to 6 m. ($1.42) per ton is expected to be followed by a general reduction of the extra for export. The Continental Steel Cartel will consider such a reduction at its next meeting.

Convention committee of the Purchasing Agents' Association of Pittsburgh is making plans for convention of the sixth district of National Purchasing Agents' Association, to be held in Pittsburgh Oct. 16 and 17.

German Home Prices Off But Export Unchanged

(By Radio)

BERLIN, GERMANY, June 30.

Steel mills in western Germany have reduced wages 7.50 per cent and the syndicate domestic prices have declined 4 to 5 m. (95c. to $1.20) per ton. Pig iron is off 2 m. (47c.) per ton. This change by the syndicates automatically reduces the syndicate price rebates to exporting manufacturers.

The price decline, however, has failed to stimulate demand from the machine shops, shipyards and building trades, and in the export field, although the Continental Steel Cartel minimum prices are unchanged, German, French and Belgian sellers are exporting semi-finished steel products, bars and shapes at less than the minimum prices.

It is expected that the Continental Steel Cartel will soon be compelled to recognize the situation and set lower minimum quotations. It is noteworthy that the export prices of sheets and plates, which are not regulated by a cartel have declined 5 to 6 m. ($1.20 to $1.42) per ton in the past month.

German steel production continues to decline, and output in May was 400,000 tons less than in May, 1929.

France to Convert Furnace Gas to Electricity

PARIS, FRANCE, June 18.—Since the Armistice, the Mining and Metallurgical Commission has been working on a plan for the construction of a network to transmit electrical energy to the mines and iron and steel plants of the Lorraine district. The plan which has been developed calls for a permanent pooling of the means of electrical power production and the operation of the metallurgical power stations in parallel. Energy from the power plants of blast furnaces will be converted from gas to electric and so used.

The present plan calls for the inclusion of 30 separate blast furnaces, operated by eight companies, and 12 complete steel works with 70 blast furnaces. These works are capable of producing a total of 3,600,000 cu. meters of gas per hour from the blast furnaces. Surplus gas is estimated at about 1,800,000 cu. meters of gas per hour, equivalent to 240 tons of coal, and this, converted into electrical energy, represents an available supply of 100,000 kwhr.

Australia Adds Items to Its High-Duty List

WASHINGTON, July 1.—Import duties on a number of products have been further increased by Australia, effective June 20. In the new list are agricultural implements, printing machines and presses, office appliances, "machines and machinery not otherwise specified", refrigerators, locomotives and road rollers.

Swedish Railroads Buy Electric Steel Rails

STOCKHOLM, SWEDEN, June 14.—A contract for 12,000 tons of electric steel rails has been awarded by the Swedish State Railways to the Stora Kopparsberg Bargslags A. B. of Falun. This is the first substantial order placed by a European railroad for electric steel rails. While the price is slightly higher than for open-hearth rails, tests are said to have demonstrated that the life of the electric steel rail is considerably greater. Sweden has always been a large importer of rails. While the electric steel rail may prove a more profitable purchase for railroads in Sweden, the cost of electric steel being comparatively low from Swedish mills, it might be too expensive for other Continental users. The recent contract is understood to have been placed at $34.75 per ton, f.o.b. mill.

German Steel Prices Lower with New Wage Level

HAMBURG, GERMANY, June 16.—Although the extent to which German steel prices will eventually be reduced is not yet known, base quotations have so far declined 4 m. to 5 m. per ton, following the wage reduction of 4 to 7½ per cent, effective July 1. The action of German mills in reducing prices is expected to be followed shortly by steel producers in Austria, Czechoslovakia and Poland. Swedish prices have already declined.

Swedish Mills May Join Tube Cartel

STOCKHOLM, SWEDEN, June 14.—Tube mills in Sweden have been negotiating with the International Tube Cartel for membership and a preliminary agreement is understood to have been concluded. Recently Swedish producers have been successful in securing a satisfactory number of export orders for lapwelded and seamless boiler tubes.

Copper Production and Consumption in 1929

(Pounds)

	1929	1928	Increase, Per Cent
Smelter output	2,002,863,135	1,825,900,393	9.7
Refinery production, new copper:			
Electrolytic	1,785,754,654	1,607,120,026	11.1
Lake	185,300,917	179,104,311	3.5
Casting	11,676,718	5,573,050	109.5
Total, domestic	1,982,732,289	1,791,797,387	10.6
Foreign	757,380,087	695,810,392	8.8
Domestic and foreign	2,740,112,376	2,487,607,779	10.2
Imports, refined copper	134,014,792	84,730,630	58.2
Total new copper available	2,874,127,168	2,572,338,409	11.7
Secondary	334,158,103	232,645,805	43.6
Total	3,208,285,271	2,804,984,214	14.4
New copper withdrawn on domestic account	1,778,585,415	1,608,538,878	10.6
Total imports, unmanufactured	974,312,201	787,073,640	23.8
Exports of metallic copper	992,895,119	1,121,186,640	(a)11.4

From United States Bureau of Mines.
(a) Decrease.

New British Designs in Steel Railroad Ties

LONDON, ENGLAND, June 18.—British railroad engineers are engaged in experiments with sections of railroad equipped with several designs of steel ties for the bullhead rail in use in the United Kingdom. Experimental steel ties have been supplied to each of the four British railroad systems by the Workington Iron & Steel Co. for trial. The company, however, has recently developed new designs which are arousing the attention of engineers.

In one of these new designs the solid one-piece chairs (rail supports) are electrically welded to the tie. Another design for flat-bottomed rails secures many of the same advantages. Both designs are said to be as free from noise as wooden ties. The maker is furnishing them in copper-bearing steels with high resistance to corrosion.

German Copper-Bearing Steel Price Low

DÜSSELDORF, GERMANY, June 18.—An increasing volume of "Patinastahl," a copper-bearing steel made by the Vereinigte Stahlwerke A. G., is being sold for agriculture in Germany and for export. The price of the copper-bearing steel is quoted on the Bessemer steel base, plus an extra of 6 per cent, which brings the cost to about the same level as open-hearth material. It is being furnished in the form of sheets, barbed, fencing and baling wire, wire netting and manufactured into containers. The maker claims its resistance to corrosion to be double that of ordinary Bessemer steel and the comparatively low price has secured a large number of users both in Germany and abroad.

Canada's Pig Iron Output Up, Steel Down, in May

TORONTO, June 24.—May production of pig iron in Canada reached a total of 80,505 gross tons, which was 11 per cent higher than the 72,339 tons reported for April and only 1 per cent below the output of 81,454 tons in May, 1929. The gain in May was due entirely to an increase in the production of malleable iron, as the tonnage of foundry iron remained about stationary, and basic iron showed a slight decline. The output of malleable rose sharply to 12,636 tons from 1826 tons in April.

For the five months ended May 31, the production aggregated 385,105 tons, a decline of 10 per cent from the total of 428,684 tons reported for the corresponding period of 1929.

May production of ferroalloys amounted to 7766 tons, compared with 7939 tons in April. Output for the month consisted mostly of ferrosilicon and ferromanganese.

Production of steel ingots and direct steel castings totaled 91,692 tons, the lowest amount reported for any month of the year. For the five months ended May 31, the production of steel ingots and direct steel castings, at 533,672 tons, was 14 per cent lower than the 619,337 tons reported for the corresponding period of last year.

Soviet Buys American Motors in Germany

HAMBURG, GERMANY, June 16.—A large number of "Hornet" and "Wasp" type aircraft motors being built by the Bayerische Motorenwerke A. G. under license from the Pratt & Whitney Aircraft Co. have been sold to the Soviet Union. A recent disagreement between the German maker and the Russian buyers, during which shipments were suspended, has been settled and the contract will continue for three years more. The Bayerische Motorenwerke also has export rights for Asia and Africa.

European Railroads Seek Less-Carload Container

HAMBURG, GERMANY, June 16.—A competition is being held by the German, Italian and French railroads for the best design of a less-carload container for use in Central Europe. Rules of the competition specify that the containers must be suitable for transportation on railroad cars and heavy motor trucks and have a capacity of five tons. The accepted design will be granted an award of $2,000 to $5,000, and a company submitting such a design will be granted a substantial order. Entries of designs may be made to any of the participating railroads until Sept. 10.

French Engineers to Tour Industrial America

A study tour for the benefit of French, Belgian, and Swiss engineers has been arranged by the United Tourist Agencies, Inc., Philadelphia. The group will leave Le Havre, July 12, on the Lafayette. The itinerary has been drawn up under the direction of Dr. Robert Grimshaw, consulting engineer, New York. Besides points of public interest, a large number of industrial establishments are included in the tour, such as the American Tool Works and the LeBlond plant in Cincinnati, the Gary works of the United States Steel Corporation, the Allis-Chalmers plant in Milwaukee, the Ford plant at Detroit, the Warner & Swasey Co. at Cleveland, the Eastman Kodak Co. at Rochester and the American Locomotive and General Electric works at Schenectady, N. Y. The visitors will leave New York Aug. 12.

Americans to Discuss Budgets at Geneva

The International Budgeting Conference will be held at Geneva, Switzerland, under the auspices of the International Management Institute, July 10, 11 and 12. Papers to be presented by Americans are:

"Budget Principles and Procedures in Their Broader Aspects," by Louis F. Musil, director of finance, Henry L. Doherty & Co., New York.

"The Budget as an Aid to the Determination of Policy," by James O. McKinsey, James O. McKinsey & Co., Chicago.

"Common Mistakes and Misunderstandings in the Use of Budgets," by Harold V. Coes, manager, industrial department, Ford, Bacon & Davis, Inc., New York.

The conference will be attended by delegates from Belgium, France, Germany, Great Britain, Italy, Switzerland, Canada and the United States.

Bethlehem Awards Prizes

Reduction of more than 75 per cent in accidents in the plants and mines of the Bethlehem Steel Corporation has been effected in the past 16 years, it was announced on June 21 at the sixteenth annual first aid and mine rescue meet, held at Bethlehem, Pa. Employees from all of the company's plants and mines participated in the event. About $2,000 in cash prizes was awarded to the winning teams in the safety drive.

Federal Steel Corporation, Detroit, has opened a Chicago branch office and warehouse at 3900 West Thirty-eighth Street, that city. The Chicago warehouse will carry a complete line of sheets, plates, bars and strips.

Production and Sales of Steel Barrels and Mechanical Stokers

	May, 1930	April, 1930	May, 1929
Steel barrels: (a)			
Production	731,087	769,061	836,532
do. five months	3,641,807(b)	.....	3,476,171
Shipments	736,147	766,617	834,699
do. five months	3,645,659(b)	.....	3,465,700
Stocks, end of month	63,031	68,091	56,939
Unfilled orders	1,454,601	1,691,461	1,215,972
Rate of operation, per cent	53.2	57.4	72.0
do. five months	52.7	.....	68.8
Mechanical stokers: (a)			
Number sold	96	108	174
do. five months	419	.....	609
Aggregate rating, hp.	31,956	35,903	60,772
do. five months	136,108	.....	225,899

(a) United States Department of Commerce.
(b) Greatest ever reached.

More Magnesite Mined in 1929

Crude magnesite mined in the United States in 1929 totaled 187,660 net tons, with an approximate value of $1,500,000, according to the Bureau of Mines. This, the largest quantity mined since 1920, was an increase of 47.5 per cent over the 127,200 tons reported in 1928. There were four operators in California, working four mines, and one at Chewelah, Wash.

Sales of magnesite of domestic origin in 1929 were 11,390 net tons of caustic calcined (a decrease of 14.4 per cent as compared with 1928), and 78,700 tons of dead-burned (an increase of 73.9 per cent as compared with 1928). The total value was $1,947,860. No sales of crude magnesite were reported by producers in 1929, whereas 1928 sales of crude magnesite from domestic mines amounted to 620 net tons, valued at $5,690.

Throughout the year caustic calcined magnesite Grade "A" (80 per cent through 200-mesh) was quoted at $43 and Grade "B" at $40 per net ton, f.o.b. California mines. The price of crude was nominally $11. Dead-burned magnesite was quoted at $29, f.o.b. California mines, and $22 to $24 per net ton, f.o.b. Chewelah. These figures compare favorably with quotations in 1928.

Imports of crude magnesite in 1929, according to the Bureau of Foreign and Domestic Commerce, were 300 net tons crude, valued at $3,179; 6500 tons caustic calcined, valued at $145,874; and 46,382 tons dead-burned, valued at $670,166.

Michigan Steel Made Year's Dividend in Five Months

Earnings of Michigan Steel Corporation for the first five months of 1930, after depreciation and Federal taxes, were sufficient to cover the regular cash dividends of the company for the entire year, together with the necessary charge against earnings for the 1 per cent stock dividend which will be paid July 21, 1930, George R. Fink, president, has announced. Michigan Steel's annual dividend rate is $2.50 a share on the 220,000 shares outstanding.

Average operations of the company's plant at Ecorse, Mich., it is stated, were maintained at 98 per cent of capacity for the first five months of the year.

The company has inaugurated a program of plant expansion that will increase production at its Ecorse, Mich., mill by 30 per cent and effect substantial savings in production costs, according to announcement by George R. Fink, president.

"The management has put into execution a program of expansion and plant rearrangement which insures a mill of the most modern construction," said Mr. Fink. "The result of this program should be an increase in capacity of approximately 30 per cent and a substantial saving in production cost."

Cement Production Less in 1929

After making new high records in every year but one since 1919, production of Portland cement in 1929 showed a drop of about 3 per cent from the maximum previous figure, made in 1928. The United States Bureau of Mines gives the total as 170,646,036 bbl., compared with 176,298,846 bbl. in 1928. The 1929 output was less also than that of 1927, but otherwise was the highest ever reached. It was more than twice as great as the production of any year preceding 1913.

Imports showed a reduction, also, the total of 1,727,900 bbl. having been 24 per cent less than 2,284,085 bbl. in 1928.

Productive capacity was engaged in 1929 to an average of 65.8 per cent, against 72.3 per cent for the smaller capacity in 1928.

Comprehensive Weights and Measures Library

A weights and measures library containing works from 1520 to the present time, and forming what is said to be the most comprehensive collection of volumes on the science of weights and measures in the possession of any educational institution, has been acquired by Columbia University, New York.

The collection is the gift of Samuel S. Dale of Boston, former editor of the *Textile World Record* and an authority on weights and measures. The works number between 1100 and 1200 volumes, together with some 700 pamphlets, and represent the accumulation of 30 years' research in this country and abroad. Nineteen languages are represented in the collection, which also includes many rare volumes.

Superior Charcoal Iron Co. to Sell Newberry Brand

The Superior Charcoal Iron Co., Grand Rapids, Mich., has taken over the charcoal pig iron sales of the Newberry brand, produced by the Newberry Lumber & Chemical Co., Newberry, Mich., effective July 1. This gives the Superior company the output of three furnaces, with a total annual capacity of 100,000 gross tons of Lake Superior charcoal pig iron.

Lancaster Iron Works, Inc., Lancaster, Pa., has moved its New York office to 370 Lexington Avenue.

Destination of Iron and Steel Exports from the United States

(In Gross Tons)

Country	May, 1930	April, 1930	May, 1929	January Through May 1930	January Through May 1929
North and Central America and West Indies	*102,791*	*94,659*	*150,930*	*508,386*	*674,368*
Canada and Newfoundland	87,162	75,665	134,559	414,656	558,558
Cuba	3,347	4,588	5,031	20,208	31,617
Guatemala	251	271	472	1,511	3,492
Honduras	358	336	636	3,231	5,991
Mexico	7,934	8,152	6,870	44,776	34,386
Panama	708	2,534	1,170	8,706	9,181
Salvador	255	227	184	1,041	3,979
British West Indies	1,543	1,433	471	6,621	10,723
Other West Indies	839	1,096	998	5,901	12,257
Other Central America	394	357	539	1,735	4,184
South America	*26,586*	*32,427*	*21,665*	*141,984*	*188,566*
Argentina	5,397	8,153	5,944	26,196	45,611
Brazil	3,054	4,641	4,322	19,209	28,835
Chile	4,651	9,274	2,930	36,885	28,962
Colombia	4,492	2,265	2,354	15,208	22,034
Peru	2,080	1,586	829	8,333	15,307
Uruguay	3,160	2,391	288	9,531	5,067
Venezuela	2,873	3,598	4,263	23,740	40,124
Other South America	879	519	735	2,882	2,626
Europe	*15,638*	*25,015*	*41,902*	*108,437*	*160,869*
France	206	1,380	783	4,143	8,289
Germany	104	382	4,412	4,217	11,954
Italy	2,652	10,544	12,945	38,840	53,942
Poland and Danzig	....	883	15,003	5,112	44,284
Soviet Russia	1,897	2,301	857	6,008	2,718
Spain	14	75	389	10,500	1,606
Sweden	607	574	248	2,286	1,463
United Kingdom	5,123	3,959	4,649	21,108	24,910
Other Europe	4,035	4,916	2,616	16,223	11,703
Far East	*49,681*	*53,483*	*46,042*	*296,549*	*311,343*
British Malaya	337	593	517	3,861	3,816
China	3,807	3,968	4,022	23,409	37,465
Netherlands East Indies	4,770	2,381	1,798	20,378	33,525
India and Ceylon	1,401	483	1,809	10,914	10,403
Hong Kong	217	1,118	45	2,750	3,107
Japan	27,801	35,619	29,706	182,425	159,229
Kwantung	2,615	2,295	118	6,260	7,262
Philippine Islands	3,780	4,393	5,031	30,935	41,973
Australia	1,080	911	1,734	5,648	8,853
New Zealand	278	448	704	1,995	2,568
Other Asia and Far East	3,595	1,274	558	7,974	3,142
Africa	*2,424*	*3,057*	*1,790*	*10,253*	*8,842*
Union of South Africa	364	567	817	2,276	3,164
Egypt	146	81	533	2,292	4,095
Mozambique	187	1,258	436	2,202	816
Other Africa	1,727	1,201	4	3,483	767
Total	196,120	208,640	262,329	1,065,609	1,343,988

Less Iron and Steel Exported

May Total Smallest in 27 Months—Loss of 21 Per Cent in Five Months Was in Finished Grades—Imports Slightly Up

WASHINGTON, July 27.—Exports of iron and steel products from the United States in May, totaling 196,120 gross tons, were the smallest since February, 1928, when they were 185,915 tons. There was a decrease of 6 per cent from April and of 25 per cent from May of last year.

Exports in the first five months of 1930, aggregating 1,065,609 tons, were 20.7 per cent below those in the corresponding period of last year. All of this loss was in rolled and finished steel, which declined 284,839 tons, whereas total exports fell off 278,379 tons.

Imports in May, amounting to 52,814 tons, were 154 tons more than those in April. When compared with May of last year the decrease was 29 per cent.

Where the Steel Went

Canada took 20,356 tons and Japan 18,012 tons of the scrap exports of 40,051 tons in May. Respective shipments of tin plate to these countries were 3509 tons and 3115 tons. Exports of black steel sheets to Canada were 6728 tons and of steel bars, 4068 tons, while 7162 tons of structural shapes went to Canada, whose total receipts of American iron and steel were 87,060 tons.

Structural shapes constituted the largest item of importation in May, with a total of 19,640 tons. Of this amount, 14,150 tons came from Belgium, 3647 tons from France and 1659 tons from Germany.

Manganese ore imports were 29,761 tons, of which 10,200 tons came from Soviet Russia, 8315 tons from Brazil, 6493 tons from the Gold Coast of Africa and 4420 tons from India. Canada supplied 2262 tons of the 4031 tons of ferromanganese imported.

Exports of Iron and Steel from the United States

(In Gross Tons)

	May		Five Months Ended May	
	1930	1929	1930	1929
Pig iron	1,072	8,088	8,171	27,689
Ferromanganese	1,004	88	4,113	909
Scrap	40,051	56,055	242,637	207,088
Pig iron, ferroalloys and scrap	*42,127*	*64,231*	*254,921*	*235,686*
Ingots, blooms, billets, sheet bar	1,788	6,704	12,555	27,039
Skelp	15,695	15,244	47,929	40,121
Wire rods	4,535	3,197	21,372	20,286
Semi-finished steel	*22,018*	*25,145*	*81,856*	*87,446*
Steel bars	7,893	14,765	49,035	94,216
Alloy steel bars	941	974	4,300	10,469
Iron bars	188	341	769	3,583
Plates, iron and steel	8,668	20,185	55,360	89,656
Sheets, galvanized steel	8,013	11,022	45,359	72,522
Sheets, galv. iron (a)	865		3,041	
Sheets, black steel	9,896	14,060	60,862	78,378
Sheets, black iron	875	1,526	5,124	6,172
Hoops, bands, strip steel	4,611	6,233	23,210	36,583
Tin plate; terne plate	17,012	14,537	111,814	118,080
Structural shapes, plain material	10,123	30,331	68,937	114,598
Structural Material, fabricated	9,332	6,652	48,623	47,308
Tanks, steel (a)	973	....	7,008	....
Steel rails	11,926	10,499	46,883	77,177
Rail fastenings, switches, frogs, etc.	1,916	2,318	8,692	13,823
Boiler tubes	1,228	1,613	8,400	8,277
Casing and oil-line pipe	7,880	8,083	38,452	64,325
Pipe, black and galvanized, welded steel (a)	8,175	8,327	40,115	56,212
Pipe, black and galvanized, welded iron (a)	1,573		8,657	
Plain wire	2,664	3,518	13,706	22,338
Barbed wire and woven wire fencing	4,462	5,409	17,842	29,293
Wire cloth and screening	152	142	721	752
Wire rope	527	505	2,270	3,183
Wire nails	623	513	3,191	6,720
Other nails and tacks	672	537	2,919	4,707
Horseshoes	12	8	61	138
Bolts, nuts, rivets and washers, except track	990	1,234	5,242	6,921
Rolled and finished steel	*122,190*	*163,332*	*680,593*	*965,431*
Cast iron pipe and fittings	2,796	2,729	15,875	13,509
Malleable iron screwed fittings	1,115	701	5,748	5,213
Car wheels and axles	2,494	1,584	7,255	11,019
Iron castings	768	1,174	3,540	6,264
Steel castings	738	1,011	5,202	5,060
Forgings	795	996	4,309	6,550
Castings and forgings	*8,706*	*8,195*	*41,929*	*47,615*
All other	1,079	1,426	6,310	7,810
Total	196,120	262,329	1,065,609	1,343,988

(a) Not separately reported prior to 1930.

Imports of Iron and Steel Products into the United States

(In Gross Tons)

May, 1930

Austria	21	United Kingdom	3,534
Belgium	17,913	*Europe*	*40,251*
Czechoslovakia	64	Canada	4,189
France	5,860	Jamaica	10
Germany	6,167	Cuba	35
Italy	135	British India	7,809
Netherlands	3,161	China	1
Norway	1,652	Japan	2
Sweden	1,544		
Switzerland	200	Total	52,297

Imports of Iron and Steel into the United States

(In Gross Tons)

	May		Five Months Ended May	
	1930	1929	1930	1929
Pig iron	13,891	14,393	56,236	62,065
Ferromanganese*	4,031	4,756	23,506	27,050
Ferrosilicon†	742	733	3,150	3,576
Ferrochrome‡	....	121	87	220
Scrap	1,749	6,837	11,779	36,615
Pig iron, ferroalloys and scrap	*20,413*	*26,840*	*94,758*	*129,526*
Steel ingots, blooms, billets and slabs	1,117	2,863	7,468	10,712
Wire rods	490	2,778	4,923	7,260
Semi-finished steel	*1,607*	*5,641*	*12,391*	*17,972*
Rails and splice bars	467	744	2,313	1,728
Structural shapes	19,640	14,744	74,216	56,833
Boiler and other plates	....	75	1,329	2,350
Sheets and saw plates	1,558	3,199	12,441	8,164
Steel bars	3,101	3,912	16,432	15,102
Bar iron	62	222	686	1,311
Hoops, bands and cotton ties	2,098	5,039	8,652	11,518
Tubular products (wrot.)	1,587	4,170	9,505	18,024
Nails, tacks, staples	229	1,099	1,864	3,461
Tin plate	11	23	57	115
Bolts, nuts, rivets and washers	59	11	214	104
Round iron and steel wire	829	467	2,523	2,971
Barbed wire	283	360	2,073	2,353
Flat wire, strip steel	110	346	665	941
Steel telegraph and telephone wire	1	....	18	....
Wire rope and strand	248	206	1,236	1,008
Other wire	5	77	164	264
Rolled and finished steel	*30,288*	*34,710*	*134,388*	*126,247*
Cast iron pipe	342	6,907	4,354	19,595
Castings and forgings	164	190	842	953
Total	52,814	74,272	246,733	294,293
Manganese ore*	29,761	27,767	147,195	112,849
Iron ore	291,372	275,762	1,401,756	1,223,783
Magnesite (dead burned)	8,492	....	21,362	8,599

*Manganese content only.
†Silicon content only.
‡Chromium content only.

Motor Car Makers Large Scrap Producers

Survey Tends to Show That Output is 1,000,000 Tons or More — Hydraulic Bundles Predominate

AUTOMOBILE manufacturers of the United States produce more than 1,000,000 tons of iron and steel scrap annually, thereby constituting one of the best single sources of scrap supply for the steel companies of the country, according to a report issued by Benjamin Schwartz, director general of the Institute of Scrap Iron and Steel, Inc., 11 West 42nd Street, New York, which has made a scrap survey of the automobile industry. The survey shows that companies, which last year produced about 85 per cent of the passenger cars, trucks and buses, had a by-product of scrap iron and steel amounting to approximately 835,000 tons.

Allowing for the companies which did not report their figures and whose motor car output made up only 15 per cent of the year's total, the institute estimates that the gross tonnage of ferrous scrap was approximately 1,000,000 tons. This tonnage represents virtually only that which is sold in the open market, some of the companies consuming a portion of their scrap production in their own plants. Making further allowance for some independent body builders and makers of parts and accessories, it is estimated that all branches of the automobile industry produced during 1929 as much as 1,200,000 tons of iron and steel scrap.

"The importance of scrap iron and steel as a raw material to the steel industry," declared Mr. Schwartz, "is shown by the fact that last year well over 30,000,000 tons of scrap was consumed by the steel industry in making a record production of steel. The importance of the sale of scrap as a revenue producer for the automobile industry is illustrated by the fact that one large automobile company probably received as much as $4,000,000 last year for its scrap accumulations. This sum, being equal to the sale of 4,000 automobiles at $1,000 each, explains why the automobile companies take greater pains than most of the other industries in the preparation and classification of their scrap by grades.

Market Scrap Through Dealers

"It is significant that the automobile companies market their scrap through scrap brokers and dealers. The largest producer of automobile scrap reports that 90 per cent of its material is sold to the scrap trade, and only 10 per cent direct to consumers. A few other companies sold negligible amounts last year direct to consumers, while the majority of companies disposed of all their scrap to the recognized brokers and dealers.

"A large part of the scrap production of Michigan automobile companies is shipped to steel mills at Pittsburgh, Youngstown, Cleveland and Buffalo, and a fair proportion of the total is transported by boat to the latter two points. Some estimates are that Buffalo mills are taking from 200,000 to 250,000 tons of scrap annually by boat from Detroit."

On the basis of the returns in the automobile scrap survey, it is indicated that the average amount of scrap produced in the manufacture of a motor car is a little under 400 lb. In the manufacture of light cars, the average probably is less than this, but there is about 1000 lb. of scrap as a by-product in the manufacture of some of the heavier cars.

Hydraulic Bundles Important Item

The importance of hydraulic compressed bundles as an item of scrap production and consumption is illustrated by the fact that the automobile companies which reported their figures to the Institute of Scrap Iron and Steel last year produced 235,279 tons of this grade. Next in tonnage was machine shop turnings, which accounted for 192,788 tons.

Following are the principal grades of iron and steel scrap produced by the automobile companies which reported their figures, together with the aggregate tonnages of each grade produced last year:

	Gross Tons
Hydraulic compressed bundles	235,279
Machine shop turnings	192,788
Flashings (light and heavy)	80,543
Mixed borings and turnings	75,358
Short shoveling turnings	67,433
Cast iron borings	43,959
Shoveling steel	28,460
Sheet clippings	17,240
No. 1 busheling	14,116
No. 2 busheling	2,517
Heavy melting steel	11,408

Miscellaneous grades, amounting to about 65,000 tons, include 2500 tons of drop forge crops separately classified by one company, but which other companies put in with heavy melting steel or shoveling steel.

Classifying Alloy Steel Grades

Some of the automobile companies, it appears from the reports, are classifying alloy steel grades with considerable care. Such minute classifications as bundled terne plate, nickel flashings, nickel solids, scrap dies, low phosphorus melting steel, 3½ per cent nickel shoveling steel, molybdenum steel shoveling turnings, besides foundry grades, such as automobile cast, gray iron castings and malleable scrap, are contained in the listings of scrap accumulations.

"This would indicate," said Mr. Schwartz, "that automobile companies have found it to their advantage to segregate grades carefully, paying especial attention to the separation of alloy steel scrap both because of the higher price obtainable for such scrap when its analysis can be guaranteed and at the same time protecting the steel mills from the troubles caused by the careless inclusion of alloy steel with ordinary carbon steel scrap."

Sees Recovery in Scrap Trade in the Fall

An optimistic keynote for the resumption of normal business in the scrap iron industry in the early fall was sounded at the meeting of the Cleveland-Detroit chapter of the Institute of Scrap Iron and Steel at the Statler Hotel, Detroit, June 25. Benjamin Schwartz, director general of the Institute, called attention to the general lack of scrap inventory in yards of both dealers and the mills, and he predicted that the recovery in scrap business would be quicker than in many other industries, as the result of this condition.

To Scrap 18 Ships

WASHINGTON, July 1.—Bids will be received Aug. 1 by the Emergency Fleet Corporation for 18 idle ships of 157,138 deadweight tons. The ships will be scrapped. They are in the New York and Philadelphia harbors.

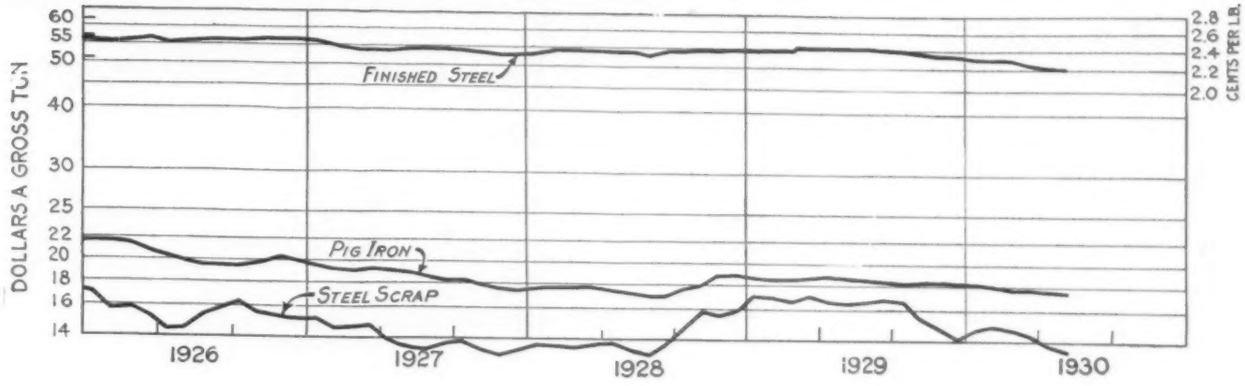
Gain in Road Building and Repair Work

The American Road Builders' Association, National Press Building, Washington, announces that it has received a summary of county expenditures for construction and maintenance of highways from 1066 counties, or slightly more than one-third of the total in the United States.

The contemplated total expenditure for highways and bridge construction for 1930 is $195,157,725, compared with an actual expenditure of $177,059,754 in 1929. In addition, these counties will expend $98,412,832 for maintenance this year, against $94,249,810 last year.

Bethlehem Steel Co. has placed an order with H. A. Brassert & Co., engineers, Chicago, for three 42-in. cold blast valves for the Cambria plant at Johnstown, Pa.

Scrap Has Sagged Much More in the Past Quarter Than Has Pig Iron. As a result the $3 differential of April 1 has become $4.25



Scrap Prices Drop Still Lower

Quarter's Average $1 Below First Quarter and the Lowest Since Summer of 1928

PRICES of heavy melting steel scrap at Chicago, Philadelphia and Pittsburgh have shown an almost steadily declining tendency since the end of the first quarter. Monthly averages have dropped so consistently that that for June is $1.57 below that for March. The figure for the last week of June, $13.17, is the lowest since the same figure was made late in July, 1928.

There has been a decline of $1.41, or almost 10 per cent, from the lowest figure of the first quarter. This is in sharp contrast to a drop of only 33c., or less than 2 per cent, in pig iron, thus opening up the differential between the two from a little over $3 at the end of March to $4.25 at the end of June. Meantime, finished steel prices have been reduced to $2.54 a net ton, or something like 5½ per cent, from the price at the end of March.

Pig iron is now at the lowest figure since early in September, 1928, when it stood at $17.34. Finished steel is lower than at any time since Aug. 1, 1922, when it was 2.169c. a lb.

All three products have shown a steady and fairly uniform drop during the past three or four months. Each is now at the lowest point it has reached in a long period of months. Monthly average figures for the past year and a half are shown in the table, while the diagram traces the course of these prices since the beginning of 1926.

	Steel Scrap (Gross Ton)	Pig Iron Ton)	Finished Steel, C. a Lb.
1925 *average*....	$17.12	$20.58	2.465
1926 *average*....	15.48	20.42	2.439
1927 *average*....	14.00	18.55	2.357
1928 *average*....	14.29	17.67	2.352
January, 1929.....	17.02	18.43	2.391
February	16.96	18.38	2.391
March	16.71	18.36	2.391
April	17.18	18.52	2.412
May	16.54	18.70	2.412
June	16.39	18.65	2.412
July	16.60	18.48	2.412
August	16.86	18.38	2.402
September	16.60	18.27	2.394
October	15.58	18.33	2.371
November	14.83	18.36	2.362
December	14.15	18.24	2.362
Year's average..	16.28	18.43	2.393
January, 1930.....	14.65	18.19	2.325
February	14.92	18.02	2.307
March	14.88	17.75	2.312
3-month average.	14.82	17.99	2.315
April	14.30	17.73	2.259
May	13.71	17.60	2.221
June	13.31	17.48	2.207
3-month average.	13.77	17.60	2.229

William H. Woodin Predicts Stable Conditions Soon

William H. Woodin, president, American Car & Foundry Co., in his report on the fiscal year ended April 30, last, stated that the company started upon the current fiscal year with a "comfortable amount of business on its books." He added the following comment regarding the business situation:

"It is a trite, but nevertheless a true thing to say that the industrial condition of the country is basically sound. Living costs and commodity prices are steadily lessening; money is plentiful and cheap; while there has been perhaps too great an increase in the facilities for production in certain lines, there is no evidence of overproduction to any considerable extent; we are assured by competent authority that the figures of unemployment are decreasing; the new tariff law has finally been enacted and commerce and industry thereby freed of the uncertainty always a concomitant of tariff revision. The country and its industries have lived through periods of depression much more severe than that of the present, and there is no reason to believe that we shall not again, and within a reasonably short time, get our soundings and attain a condition of stable equilibrium."

The American Car & Foundry Co. reported a net profit for the past fiscal year of plenty more than $5.40 a share on the 600,000 shares common stock outstanding.

Dry Quenching of Coke

Cooling of by-product coke with automatically formed inert gases, and without dousing it with water, was described in a paper by William O. Renkin, read early in June at Detroit before the American Society of Mechanical Engineers. The paper describes the process of using the sensible heat in the glowing coke to heat the gases used in cooling. These in turn pass through boilers producing steam for the use of the plant.

This method has been in use for a sufficiently long time so that it is possible to give performance figures. Description of such plants, including at least one illustrated in this paper, was published in THE IRON AGE in articles appearing Feb. 10, 1927, page 425; March 17, 1927, page 787; March 24, 1927, page 845, and April 7, 1928, page 943.

Mr. Renkin's paper details the expected savings to be obtained from the use of the method described, and concludes that the waste and discomfort caused by water quenching of by-product coke are economically indefensible. The paper is full of diagrams and calculations, besides a considerable number of halftone illustrations of existing plants. Copies of the paper are available at Dry Quenching Equipment Corporation, 200 Madison Avenue, New York.

A decision of the Illinois Supreme Court, announced June 22, requires refund to the Interstate Iron & Steel Co. of franchise tax of new shares of no par value common stock which were issued in exchange for shares of old common stock.

Inland Steel Co. of Wisconsin, West Allis, Milwaukee, has plans for new administration building costing about $100,000 with complete equipment. Structure will house main, executive, production and time departments and plant hospital.

Machinery Exports Maintain Volume

First Five Months Make New High Record— Imports Are Behind Last Year

WASHINGTON, June 27.—Exports of machinery from the United States in May were valued at $49,526,306, a decline of $1,666,525 from April, but $1,472,875 above May, 1929. In the first five months of 1930, however, exports, aggregating $270,781,173, showed an increase of $15,680,812 over those in the corresponding period of last year.

This made the largest total ever recorded in the first five months of any year. Exports of industrial machinery, as classified by the Division of Statistics, Department of Commerce, were $23,918,704 in May. In the first five months of 1930 they were $116,248,708, compared with $111,902,282 in the corresponding period of 1929.

Exports of power-driven machine tools in May totaled 1109 units, valued at $2,414,374, against 890, valued at $1,861.919, in April.

Imports of machinery and vehicles in May were valued at $2,755,465, a drop of more than 47 per cent from April. In the five months of 1930 they were $16,981,156 as against $18,145,140 in the corresponding period of last year.

Imports of such machinery as is listed in THE IRON AGE table were valued at $2,139,384 in May, against $3,223,539 in April.

Steel Shipments by Rivers in May Gained Heavily

Shipments of steel products on the Ohio River in the Pittsburgh district during May amounted to 128,502 net tons, an increase of almost 100 per cent over the 66,482 tons shipped during April and a large gain over the 102,162 tons moved during May, 1929. These figures are compiled by the United States Engineer Office, Pittsburgh.

On the Monongahela River, May steel shipments totaled 117,942 tons, as compared with 70,229 tons in the preceding month and with 88,340 tons in May, 1929.

No movement of steel was reported on the Allegheny River during May, while 1000 tons was shipped in April and 525 tons in May of last year.

A large part of the increased shipments on the Ohio and Monongahela rivers is attributed to heavier movement of steel pipe, which is rapidly being increased as delivery begins on recent pipe line projects. The increased railroad freight rates which went into effect during May also diverted some additional tonnage to the rivers, and barge lines report a severe shortage of barges at the present time.

Exports of Power-Driven Metal-Working Machine Tools

	May, 1930		April, 1930	
	No.	Value	No.	Value
Engine lathes	254	$616,374	193	$296,584
Turret lathes	57	229,890	35	117,051
Other lathes	94	218,653	58	102,555
Vertical boring mills and chucking machines	8	20,641	34	115,267
Thread-cutting and automatic screw machines	75	94,310	69	118,423
Knee and column-type milling machines	21	78,689	35	106,576
Other milling machines	80	330,165	75	213,705
Gear-cutting machines	40	119,935	37	89,193
Vertical drilling machines	41	66,833	36	74,909
Radial drilling machines	12	15,145	20	58,502
Other drilling machines	90	126,654	118	93,927
Planers and shapers	49	107,311	48	146,084
External and cylindrical grinding machines	78	201,580	69	162,201
Internal grinding machines	28	108,422	22	98,660
Metal-working tool-sharpening machines	182	79,772	131	68,282
Total	1,109	$2,414,374	890	$1,861,919

Imports of Machinery into the United States

(By Value)

	May		Five Months Ended May	
	1930	1929	1930	1929
Metal-working machine tools	$112,754	$62,865	$498,192	$489,689
Agricultural machinery and implements	818,931	1,103,485	6,679,665	4,648,081
Electrical machinery and apparatus	278,652	194,172	877,750	948,945
Other power-generating machinery	62,909	148,862	236,551	488,965
Other industrial machinery	609,458	1,135,078	3,908,274	5,477,914
Vehicles, except agricultural	256,680	547,325	1,081,685	2,170,175
Total	$2,139,384	$3,191,787	$13,282,117	$14,223,769

Machinery Exports from the United States

(By Value in Thousands of Dollars)

	May		Five Months Ended May	
	1930	1929	1930	1929
Locomotives	$108	$108	$398	$778
Other steam engines	103	72	330	475
Boilers	125	150	610	766
Accessories and parts	76	28	304	334
Automobile engines	691	1,303	4,298	6,898
Other internal combustion engines	937	811	5,955	4,485
Accessories and parts	365	472	1,736	2,059
Electric locomotives	130	13	519	298
Other electric machinery and apparatus	852	903	4,518	5,785
Excavating machinery	710	867	4,838	3,577
Concrete mixers	122	80	522	616
Road-making machinery	512	427	2,140	1,428
Elevators and Elevator machinery	475	317	2,708	2,117
Mining and quarrying machinery	1,292	1,633	7,834	6,989
Oil-well machinery	2,100	1,872	13,390	10,930
Pumps	1,027	834	4,558	5,195
Bending and power presses	421	250	2,200	1,398
Forging machinery	165	65	995	574
Machine tools*	3,818	1,209	12,904	7,826
Other metal-working machinery and parts	631	624	3,178	3,179
Textile machinery	634	1,120	4,082	5,964
Sewing machines	767	810	3,657	4,343
Shoe machinery	187	177	806	937
Flour-mill and gristmill machinery	17	58	176	265
Sugar-mill machinery	333	257	936	1,128
Paper and pulp-mill machinery	253	288	1,236	1,237
Sawmill machinery	71	67	412	395
Other woodworking machinery	121	209	751	971
Refrigerating and ice-making machinery	202	158	1,646	2,155
Air compressors	613	587	3,020	3,249
Typewriters	1,486	1,792	8,831	10,176
Power laundry machinery	161	183	792	846
Typesetting machines	1,486	509	8,830	2,666
Printing presses	414	791	2,390	3,196
Agricultural machinery and implements	9,615	11,263	71,210	60,027
All other machinery and parts	18,506	17,746	88,071	91,839
Total	$49.526	$48,053	$270,781	$255,100

*Principal items detailed in another table.

Machinery Markets and News of the Works

Machine Tool Market Listless

Demand Has Fallen to a Low Point With Not Much Prospect of Early Improvement

MACHINE tool markets are listless, and interest in the purchase of equipment among companies which normally are depended upon for the bulk of the business is so slight that machinery sellers are unable to gage the time when an upturn may be expected. There is little hope that improvement will come until after the summer months.

The Chicago Board of Education is asking for bids on 14 tools, but otherwise there is no domestic inquiry of size in the market. The Amtorg Trading Corporation, New York, continues to inquire for tools for shipment to Russia. A company in Holland has ordered six production lathes from a Cincinnati builder.

Machine tool plants are curtailing production schedules, and a good many plants will be shut down entirely during the first 10 days or two weeks of July.

New York

NEW YORK, July 1.—There has been no change in the machine tool situation in the past week. June sales were about equal to those of May, with some sellers, but others report that the June volume was somewhat below that of the preceding month. Both May and June were considerably poorer than any of the first four months of the year. Prospective business is almost nil. The local trade does not look for any early change from the present dullness.

Board of Education, Park Avenue and Fifty-ninth Street, New York, will receive bids on general contract until July 8 for eight-story boys' technical high school, Fort Greene Place and De Kalb Avenue, Brooklyn, to cost $5,680,000 with equipment. W. C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect for board.

Sidney Daub, 155 East Forty-second Street, New York, architect, has filed plans for a one-story automobile service, repair and garage building, 50 x 197 ft., to cost about $200,000 with equipment.

Freeport Sulphur Co., a subsidiary of Freeport Texas Co., 52 Wall Street, New York, has leased 700 acres of sulphur properties from Shell Petroleum Co., St. Louis, at Black Bayou, Cameron Parish, La., and plans early development, including installation of drilling machinery, conveying, loading and other mechanical equipment.

Fairchild Aviation Corporation, 122 East Forty-second Street, New York, has arranged for a stock issue to total $1,172,684, part of proceeds to be used for expansion. Company is a subsidiary of Aviation Corporation of the Americas, Inc., same address.

Peter P. Cappel, 70 Bowery, New York, has plans for a three-story automobile service, repair and garage building, to cost over $150,000 with equipment.

Acme Steel Partition Co., 320 West Thirty-seventh Street, New York, has leased entire two-story building, 50 x 100 ft., at 621-23 West Forty-second Street for expansion.

Katzer & Schwartz, 269 Avenue C, New York, manufacturers of cabinets, etc., have leased a floor in building at 608-10 East Eighteenth Street for expansion.

Vacuum Oil Co., 61 Broadway, New York, has asked bids on general contract for a two-story addition to works at Paulsboro, N. J., 40 x 70 ft., to cost close to $40,000 with equipment.

Gorton Heating Corporation, Garwood, N. J., manufacturer of heating systems and equipment, is reorganizing and in future will maintain headquarters at local factory. Company is affiliated with Lidgerwood Mfg. Co., Elizabeth, N. J., manufacturer of hoists, etc., and Lane McLean, vice-president and general manager of latter organization, will be an official of Gorton company, which will also be closely identified with Esda Mfg. Co., operating a plant at Garwood for production of water heaters and parts; John L. Lehman, president of Esda company, has been elected president and treasurer of Gorton organization.

Wallace & Tiernan Co., Inc., 11 Mill Street, Belleville, N. J., manufacturer of chlorine control equipment, water sterilizers, etc., is taking bids on general contract until July 8 for four-story addition, 77 x 169 ft., to cost over $150,000 with machinery. Fletcher-Thompson, Inc., 542 Fairfield Avenue, Bridgeport, Conn., and 31 Fulton Street, Newark, is architect and engineer.

Consolidated Film Industries, Inc., 1776 Broadway, New York, will soon begin erection of one-story addition to plant at Fort Lee, N. J., to be used primarily as a machine shop, to cost over $50,000 with equipment; other part of unit will be used for storage and distribution. G. W. Dexter, Fort Lee Trust Building, is architect.

Board of City Commissioners, City Hall, Perth Amboy, N. J., is considering extensions and improvements in municipal electric power plant and system, including installation of new generating unit, to cost about $90,000. Commissioner John V. Smith, director, department of public works, is in charge.

Westinghouse Electric & Mfg. Co., East Pittsburgh, is planning early occupancy of new factory branch and distributing plant on 24-acre tract on Haynes Avenue, meadow district, Newark, recently acquired from city, consisting of two-story unit to cost over $400,000 with equipment. Structure is scheduled for completion during summer and will be used for switchboard panels and kindred apparatus. It will be supplemented by other units later to make a total investment of over $1,000,000. Company is increasing operations at plant at Orange and Plane Streets, Newark, which is now given over to a number of new specialties, including small motors for electric clocks and equipment for industrial power, following removal of radio manufacturing division a few months ago. This factory will be operated in conjunction with new meadow plant.

General Cable Corporation has awarded contract to H. K. Ferguson Co., Cleveland, for construction of additions to its Standard Underground Cable plant at Perth Amboy, N. J. Two units, with total floor area of 32,000 sq. ft., costing about $100,000 will be built.

Brettler Sheet Metal Works and Brettler Steel Tank Works have removed their offices and plants to larger quarters at 520 Casanova Street, Bronx, N. Y.

New England

BOSTON, June 30.—This month has been dull, with most machine tool dealers, and July starts with small prospect of improvement. Some dealers, however, look for a revival in business before Aug. 1. New England machine tool builders in general are operating on a considerably curtailed schedule.

Small tools are selling fairly well, although June bookings fell off sharply as compared with May. A few makers of small tools, however, are fairly busy.

Merrimac Chemical Co., Everett, Mass., has closed bids on a machine and carpenter shop. Equipment will be purchased.

Norton Co., Worcester, Mass., has started a one-story furnace building addition, 44 x 66 ft., to cost $12,000 without equipment.

Langelier Mfg. Co., Cranston, R. I., is considering plans for a machine shop addition.

Navy Department has appropriated $68,000 for power house improvements at Boston Navy Yard, and $55,000 for an electric lighting plant at Portsmouth, N. H.

McClintock & Craig, architects, Springfield, Mass., will take bids in July on a three-story and basement repair shop and storage building for the city, 80 x 100 ft.

City of Providence, R. I., will close bids July 14 on a junior high school to cost $1,250,000, to include wood-working, sheet metal and machine shops.

L. G. Balfour & Co., Attleboro, Mass., manufacturer of jewelry, plated ware, etc., has filed plans for factory power plant, to cost over $40,000 with equipment. General contract has been let to H. O. MacKinnon & Co., 38 Emery Street.

Boston Ice Co., 11 Deerfield Street, Boston, has plans for one-story ice-manufacturing plants at Melrose and at Revere, each to cost over $50,000 with machinery. C. Leslie Weir, 13 East Thirty-seventh Street, New York, is architect and engineer.

Standard Foundry Co., Worcester, Mass., a subsidiary of Crompton & Knowles Loom Works, has purchased group of 11 buildings heretofore held by Worcester Woolen Mill Co., and will remodel for expansion.

Charles L. Nutter, 147 Union Street, East Bridgewater, Mass., and associates have organized Vincent Mfg. Co., to operate a local plant for manufacture of automatic heating equipment and devices. Mr. Nutter will be treasurer of company; Gerald J. Henry will be president.

United Illuminating Co., 128 Temple Street, New Haven, Conn., has awarded general contract to R. E. Hurley Construction Co., Bridgeport, Conn., for an addition to Steel Point steam-operated electric power plant at Bridgeport, to cost over $250,000 with equipment. Westcott & Mapes, Inc., 139 Orange Street, New Haven, is engineer.

North Eastern Metal Products Co., New Haven, Conn., has been organized by F. H. McTigue and H. C. Kelly, both of Holyoke, Mass., with capital of $50,000, to operate a local factory for manufacture of metal-covered fire doors and other sheet metal products. L. W. Lee, Woodmont, Conn., is interested in new company.

Buffalo

BUFFALO, June 30.—Mathieson Alkali Works, Inc., Niagara Falls, N. Y., will soon take bids for a two-story addition, including improvements in present building, to cost about $70,000 with equipment. W. I. Deming, 108 Seventeenth Street, N. W., Washington, is company architect.

Anthony Lasheir & Co., 2564 Seneca Avenue, Niagara Falls, N. Y., general contractors, are arranging for purchase of controlling interest in Reed-Coddington Engineering Co., 238 Portage Road, engineer and contractor for heavy construction, operating a stone-crushing plant and engineering works. Acquiring company will continue plant at present location and plans expansion.

Robert W. Johanns, 36 East Fourth Street, Dunkirk, N. Y., and associates have organized Bob Johanns, Inc., with capital of $50,000, to operate a local plant for manufacture of machinery and parts. John A. Kunzler, 715 Park Avenue, is interested in new company.

City Council, Clayton, N. Y., has acquired 184-acre tract as site for new municipal airport and will have plans drawn soon for hangars, repair shop and other field units, to cost over $75,000 with equipment. Chamber of Commerce is interested in project.

Standard Oil Co., 170 Thirteenth Street, Niagara Falls, N. Y., is planning new oil storage and distributing plant, to cost over $50,000 with equipment.

Automatic Voting Machine Corporation, Jamestown, N. Y., is arranging to increase production schedules, following receipt of orders for voting machines totaling over $400,000.

Philadelphia

PHILADELPHIA, June 30.—Auto Equipment & Service Co., 1421 North Broad Street, Philadelphia, has purchased new ten-story building at 1522-24 Fairmount Avenue for new plant.

E. Purdy, Philadelphia, care of Smith-Hardican Co., 1809 Callowhill Street, contractor, has awarded general contract to last-noted company for a sheet metal-working shop, one story, to cost close to $30,000 with equipment.

T. C. Smith & Co., Inc., Philadelphia, has been organized with capital of $50,000 to take over and expand company of same name, with plant at 3915 Powellton Avenue, manufacturer of electrical equipment and devices. New company is headed by T. C. Smith, who will be treasurer; B. M. Smith and A. J. Fullerton.

Purchasing department, Day & Zimmermann Engineering & Construction Co., 112 North Broad Street, Philadelphia, will receive bids until July 21 for swinging door locks for use at Eastern State Penitentiary.

O. Edwin Decker Foundries Co., Inc., Philadelphia, O. Edwin Decker, head, has acquired for local plant buildings Nos. 25, 26 and 27 at 4041 Ridge Avenue, formerly occupied by John & James Dobson Carpet Mills.

Pennsylvania Railroad Co., Philadelphia, has awarded general contract to United Engineers & Constructors, Inc., 112 North Broad Street, for one-story battery station for use in connection with electrification of local lines, to cost about $35,000 with equipment.

RCA-Victor, Inc., Camden, N. J., manufacturer of radio equipment, talking machines, etc., is arranging for increase in present capacity, and plans early occupancy of new multi-story factory unit, totaling 154,000 sq. ft. floor space, to be equipped almost exclusively for assembling. Facilities will be provided for a rated output of 9000 complete radio sets daily. Company has leased former Pavonia car shops of Pennsylvania Railroad, East Camden, and will remodel for new storage and distributing division. E. E. Shumaker is president.

Continental Can Co., 1 Pershing Square, New York, is considering construction of new multi-story tin can-manufacturing plant near Campbell Soup Co., Camden, N. J., to furnish that company with its requirements, to cost over $750,000 with machinery.

City Commission, Trenton, N. J., is arranging early call for bids for turbine-type, motor-driven pumping machinery for municipal water station, entire expansion to cost about $50,000. Commissioner Abram Swan, Jr., director, department of public works, is in charge.

General Door Operator Corporation, Wilmington, Del., recently organized by F. F. Slocomb, head of F. F. Slocomb & Co., Inc., Fourteenth and Poplar Streets, manufacturer of leather-working machinery, etc., and associates, is planning early production of new automatic electric door operator in seven different types, and for time being will maintain headquarters and production at Slocomb plant, part of which will be arranged for new line of output. Mr. Slocomb will be vice-president of General Door company; Charles F. Young is president, and Paul R. Hawn, secretary and treasurer.

Motor Parts Co., Inc., Philadelphia, has been organized by F. W. Wilkening, Fifteenth and Mount Vernon Streets, and associates, to take over and expand company of same name, with works at 818 North Broad Street. A general repair works will also be operated.

South Atlantic

BALTIMORE, June 30.—Ballauf Mfg. Co., 621 H Street, N. W., Washington, manufacturer of machinery and parts, has plans for a three-story addition, 42 x 91 ft., to cost over $50,000 with equipment. E. W. Syme, 906 Fifteenth Street, is architect.

Maryland Brass & Metal Works, Calvert and Federal Streets, Baltimore, manufacturer of brass, bronze, aluminum and other metal castings, is erecting new one-story foundry and plant, 50 x 200 ft., at Rosedale Station, near city limits, to cost over $60,000 with equipment. Contract was recently let to Maryland Metal Building Co., McComas and Race Streets.

Horace E. Dodge Boat & Plane Corporation, Newport News, Va., is planning expansion in fall for increase in present capacity, which approximates 40 complete motor boats daily under 24-hr. schedule. Company recently established new plant here representing investment of over $1,000,000, removing former works from Detroit.

Georgia Granite Co., Elberton, Ga., has plans for one-story granite-working shop, 55 x 340 ft., for cutting, sawing, polishing, etc., to cost over $30,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, is asking bids until July 8 for one electric smelting furnace for local navy yard, also for one motor-driven precision lathe for Brooklyn navy yard; and until July 15 for one jogging hydraulic press for Puget Sound yard.

Board of District Commissioners, District Building, Washington, will soon begin erection of additions to municipal mechanical repair shop, including automobile service, repair and garage unit, to cost over $225,000 with equipment. A. L. Harris, District Building, is municipal architect.

Work will soon begin on three-story and basement building, 30 x 90 ft., at Asheville, N. C., to be occupied by Crane Co., Chicago, under lease, for new fractory branch and distributing plant, to cost $50,000 with equipment. Henry I. Gaines, Public Service Building, Asheville, is architect.

Board of Trustees, University of Virginia, University, is planning extensions and improvements in central steam power plant, to cost about $150,000 with equipment.

Ditch, Bowers & Taylor, Inc., 1430 North Charles Street, Baltimore, has awarded general contract to Charles L. Stockhausen Co., Inc., Gay and Water Streets, for one and two-story automobile service, repair and garage building,

130 x 142 ft., to replace unit recently destroyed by fire, to cost about $100,000 with equipment.

Board of District Commissioners, District Building, Washington, has plans for three-story business, commercial and industrial high school, to cost about $1,500,000 with equipment. Board is also considering installation of manual training equipment in new Deal junior high school, for which bids are being asked on general contract until July 15. A. L. Harris, District Building, is municipal architect in charge of both structures.

Crisp County Power Commission, Cordele, Ga., will soon begin construction of new county power plant, to cost over $80,000 with equipment.

Board of Trustees, University of Maryland, College Park, has plans for one-story power house for central steam heating service, to cost over $75,000 with equipment. Smith & May, Baltimore Trust Building, Baltimore, are architects.

Pittsburgh

PITTSBURGH, June 30.—The month's business with some dealers in this district compares favorably with June last year and has been fully equal to the year's average to date. No heavy buying is reported, but salesmen are particularly active in canvassing the trade and in many cases are successful in bringing in orders which are more or less unexpected. Single tools and repair parts predominate on local order books.

No inquiries of size are before the trade, but large industrial buyers, such as Westinghouse Electric & Mfg. Co., are placing business as usual. Considerable activity in used tools is reported in this district. Railroad buying of consequence is lacking, and there is little prospect of any immediate recovery.

Erie Enameling Co., West Twentieth Street, Erie, Pa., has awarded general contract to E. E. Austin & Son, Twentieth and Reed Streets, for one-story addition, 60 x 120 ft., to cost about $45,000 with equipment.

J. B. Berry Sons Co., Rouseville, Pa., has plans for rebuilding part of local gasoline refinery recently destroyed by fire.

R. C. Stolfer, 218 West Chestnut Street, Washington, Pa., and associates have organized Sheet Metal Corporation to operate a local plant for manufacture of sheet metal products. Mr. Stolfer will be treasurer. James Shue, 252 West Chestnut Street, will be an official of new company.

Hamilton-Standard Propeller Co., West Homestead, Pa., will develop maximum plant capacity, following recent receipt of order from United States Army for airplane propellers totaling about $162,000. Units will be made of aluminum alloy. Company is carrying out experiments for manufacture of propellors from magnesium alloy and is planning facilities for production.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, is planning early construction of multi-story addition to plant of paint, varnish and lacquer division at Milwaukee, to cost about $1,000,000 with equipment.

Board of Commissioners, Marion County, Fairmont, W. Va., has leased about 40 acres fronting on highway leading to Boothsville, and plans construction of airport, including hangars, repair and reconditioning shop and other field units.

Delaware, Lackawanna & Western Coal Co., Fairmont, W. Va., is considering rebuilding tipple at coal properties, near Booth, W. Va., recently destroyed by fire.

Cincinnati

CINCINNATI, June 30.—Machine tool demand is spotty. While builders of shapers and some makers of lathes reported business good, bookings by other manufacturers showed no improvement over the previous week. Inquiry has quickened slightly, however, but quotations have failed to bring any action from buyers. Orders the past week were mostly for one or two standard machines and came from widely scattered sources. Several plants will close for the next 10 days to two weeks for the usual vacation period; others contemplate similar action.

Interest in foreign business is more active with the receipt of an inquiry from the Amtorg Trading Corporation for various types of tools. A buyer in Holland placed an order for six production lathes with a local manufacturer.

Central Radial Drill Co., 1767 Elmore Street, Cumminsville, Cincinnati, manufacturer of drilling machines, parts, etc., is considering one-story plant at Sidney, Ohio, to cost about $30,000 with equipment. Company is negotiating with city for lease of 20 acres of land with privilege of purchase, and proposes to expand initial plant at later date. R. B. Busch is head.

Midwest Mfg. Co., Hamilton, Ohio, manufacturer of gasoline locomotives, etc., is planning rebuilding of portion of plant recently destroyed by fire with loss of about $35,000, including equipment.

Kilgore Mfg. Co., Westerville, Ohio, manufacturer of toy pistols and kindred products, has awarded general contract to R. O. Karg, Westerville, for one-story addition, 60 x 63 ft., to cost about $25,000 with equipment.

Mobile & Ohio Railroad Co., Fullerton Building, St. Louis, is considering one-story plant unit at shops at Jackson, Tenn., for reclaiming iron and steel scrap, etc., reported to cost about $35,000 with equipment. B. A. Wood, address noted, is chief engineer.

Emmart Packing Co., Louisville, is planning rebuilding of portion of meat-packing plant recently destroyed by fire with loss reported in excess of $275,000, including equipment.

Board of Education, Lebanon Junction, Ky., is planning installation of manual training equipment in new two-story and basement school, estimated to cost $150,000. H. E. Boyle & Co., Furniture Building, Evansville, Ind., are architects, in charge.

Raymond Paper Bag Co., Middletown, Ohio, is contemplating new plant unit to cost over $200,000 with machinery.

Contracting Officer, Wright Field, Dayton, Ohio, is asking bids until July 9 for 419 starter assemblies; also, until July 16, for pump, gaskets, springs and other mechanical equipment.

Dayton Airplane Engine Co., Dayton, Ohio, will develop maximum capacity at plant both for parts production and assembling. Company has received order from Pheasant Aircraft Corporation, Fond du Lac, Wis., for 800 complete motor units, totaling about $225,000. Plans are maturing for regular production of a four-cylinder aircraft engine for use in airplanes of light type. G. A. Funkhouser is president.

Board of Trustees, Tennessee Junior College, Martin, Tenn., has awarded general contract to Bell Brothers & Co., Murfreesboro, Tenn., for two-story industrial arts building, 100 x 148 ft., and two-story physical education unit, 82 x 148 ft., to cost about $160,000 with equipment. Barber & McMurray, General Building, Knoxville, Tenn., are architects.

S. & S. Metal Products Co., Covington, Ky., recently formed with capital of $36,000 by Max Stopper, Covington, and associates, plans operation of local plant for production of line of metal goods. A. E. Clifton, Covington, is also interested in new organization.

Detroit

DETROIT, June 30.—Muskegon Motor Specialties Co., Muskegon, is planning early removal of camshaft division of Jackson Motor Shaft Co., Jackson, recently acquired, to Muskegon, where facilities will be provided to double present capacity. Other divisions of company at Jackson will be continued for time being.

Michigan Paper Co., Plainwell, has awarded general contract to D. F. Miller Co., Kalamazoo, for two-story steam power plant, 50 x 108 ft., to cost about $60,000 with equipment. Work will be carried out with general expansion program to cost over $300,000, including electrification of different departments to replace former steam operation. C. F. Hershfield is company engineer.

United States Pressed Steel Co., Ypsilanti, now removing its plant to property recently secured at Kalamazoo, has taken out a permit for one-story addition, 55 x 70 ft., and will make extensions and improvements in existing buildings.

Wilcox-Rich Corporation, Rust Street, Saginaw, manufacturer of valves and other automobile engine equipment, has asked bids on general contract for two one-story additions, to cost about $150,000 with machinery. Cowles & Mutcheller, Adams Building, are architects.

Port Huron Thresher Co., Port Huron, recently organized, has taken over local plant and business of Port Huron Engine & Thresher Co. for production of combine harvesting machines, threshers, power corn shellers and kindred equipment. E. L. Wilson, formerly manager of Port Huron Engine Company, will act in same capacity for new organization.

Motor Wheel Corporation, Saginaw Street, Lansing, manufacturer of automobile wire wheels, etc., is planning two-story addition to cost about $200,000 with machinery. Company engineering department is in charge. Work will be carried out with general expansion program, following recent acquisition of Cleveland Welding Co., Cleveland.

Chris-Craft Corporation, Algonac, has been chartered by officials of Chris Smith & Sons Boat Co., operating local plant, to take over and expand that organization.

Charles T. Chance, 300 Whitmore Road, Detroit, and associates have organized Chance Processed Steel Co., with capital of $10,000, and will operate local plant for manufacture of special steel products.

Mr. Chance will head new organization. Henry R. MacGillis, Dearborn, is interested in company.

Bull Dog Electric Products Co., 7610 Joseph Campau Avenue, Detroit, has arranged for increase in capital from $500,000 to $1,000,000, part of fund to be used for expansion.

Chicago

CHICAGO, June 30.—Machine tool sales are light and inquiries unusually spotty. The curtailment of purchases is less disturbing to dealers than is the lack of interest in equipment, for the reason that until inquiries develop on a wider scale, little idea can be gathered as to the probability of an upturn in the market. The Union Pacific is said to have closed for the last items on its list. A few purchases are being made by machine tool manufacturers who are bringing plant equipment up to date.

Chicago Board of Education is asking for one 11-in. x 4-ft. lathe, two two-wheel grinders, two No. 20 drilling machines, two 16-in. band saws, five motor-in-head lathes, 12 in. x 35 in., two wet tool grinders

John Deere & Co., Third Avenue, Moline, Ill., manufacturers of plows and other agricultural implements, have awarded general contract to H. A. Main & Co., Marsh Place Building, Waterloo, Iowa, for extensions and improvements in Moline plant to cost about $65,000. O. A. Echerman, Moline, is company engineer.

Cyclone Fence Co., North Chicago, Ill., manufacturer of wire fencing, is considering new plant unit at DeKalb, Ill., to cost over $50,000 with equipment.

Ellerbe & Co., Minnesota Building, St. Paul, Minn., architects, have awarded general contract to Lovering-Longbotham Co., Builders' Exchange, for a six-story automobile service, repair and garage building, to cost about $375,000 with equipment.

Board of Education, School District No. 1, Administration Building, Denver, is planning installation of manual training equipment in new two and three-story and basement Horace Mann Junior High School, to cost about $500,000, for which bids are being asked on general contract until July 9. T. H. Buell & Co., United States National Bank Building, are architects; Jay W. McCullough, Insurance Building, is engineer.

Fairmont Railway Motors, Inc., Fairmont, Minn., manufacturer of electric railroad equipment, has taken bids on general contract for a one-story addition for storage and distributing service, estimated to cost $150,000 with equipment. Frank D. Chase, Inc., 720 North Michigan Boulevard, Chicago, is architect and engineer.

Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, has plans for a new blending and compounding plant and addition to storage and distributing plant at Pueblo, Colo., to cost about $75,000 with equipment.

International Harvester Co., 606 South Michigan Avenue, Chicago, has awarded general contract to Gray Construction Co., Goss Building, Watertown, S. D., for one-story factory branch and distributing plant at Watertown, to cost over $70,000 with equipment. W. D. Price is company construction engineer, in charge.

St. Louis

ST. LOUIS, June 30.—American Car & Foundry Co., 2800 DeKalb Avenue, St. Louis, is planning one and two-story additions, 160 x 680 ft., and 50 x 60 ft., to cost over $300,000 with equipment, scheduled for completion in October.

American Steel Foundry Co., East St. Louis, Ill., has approved plans for one-story addition, 100 x 125 ft., for storage and distribution, to cost about $40,000 with equipment.

Gooch Milling & Elevator Co., Sixth and South Streets, Lincoln, Neb., is planning addition to feed mill and grain elevator, with conveying, elevating, screening and other mechanical equipment, to cost about $200,000. H. E. Gooch is president.

Quaker Petroleum Co., Fourteenth and Nicholas Streets, Omaha, Neb., is considering new oil compounding, packing and barreling plant, to cost about $140,000 with equipment.

State Highway Department, Jefferson City, Mo., C. D. Matthews, chairman, has plans for two and three-story automobile service, repair and garage building for State cars and motor trucks, to cost about $200,000 with equipment.

A. Kilpatrick Sons Foundry Co., 625 East Carrie Street, St. Louis, recently organized by Alfred B. Kilpatrick and associates, with capital of $181,277, will take over and expand company of same name, specializing in production of iron castings, cast iron kettles, etc.

Kansas City Barrel Co., Kansas City, Mo., manufacturer of wire-bound barrels, kegs, casks, etc., has awarded general contract to Joseph Gier, 410 East Fifty-fourth Street, for one-story plant at North Kansas City, 110 x 200 ft., to cost over $75,000 with equipment. Chester E. Dean and Maurice Carroll, 713 Linwood Boulevard, are architects.

Brilliant Sign Co., 3522 Washington Avenue, St. Louis, manufacturer of displays, signs, etc., has taken bids on general contract for a four-story and basement addition, 33 x 57 ft., to cost over $80,000 with equipment. Aegerter & Bailey, Railway Exchange Building, are architects.

City Council, Chelsea, Okla., is considering extensions and improvements in municipal electric light and power plant, including installation of Diesel engines and auxiliary equipment. C. L. Brodie is city engineer.

Stupp Brothers Bridge & Iron Co. has consolidated its contracting office with general office at its plant, 3800 Weber Road, St. Louis.

Indiana

INDIANAPOLIS, June 30.—Warner Gear Co., Muncie, a unit of Borg-Warner Corporation, Chicago, has approved plans for one-story plant near city limits, with capacity of 2000 automobile transmissions daily, to cost over $100,000 with machinery.

Board of Education, Gary, plans installation of manual training equipment in new three-story Lew Wallace High School for which bids have been asked on general contract, to cost close to $1,000,000. William B. Ittner, Inc., Continental Life Building, St. Louis, is architect.

Master Electric Co., Dayton, Ohio, manufacturer of electrical specialties, has purchased Reiss Mfg. Co., Kokomo, manufacturer of brake-service machinery and parts, garage equipment, etc. Kokomo plant will be continued, and expansion for manufacture of new line of automotive equipment is planned.

Indianapolis Power & Light Co., 48 Monument Circle, Indianapolis, is considering early construction of new steam-operated electric generating plant, 200 x 200 ft., to cost over $7,000,000 with equipment. Station will secure water supply from White River.

Electrostone Co., Rushville, recently organized by C. T. DeHore, president of Indianapolis Southeastern Railroad Co., Traction Terminal Building, Indianapolis, and associates, has taken over local building for new plant to manufacture building materials, using gypsum as base. Mr. DeHore will be president of new company; George C. Keech, vice-president, and L. S. Eastman, secretary and treasurer. Henry Kuhn has been appointed works manager.

Board of Trustees, Indiana State Reformatory, Pendleton, is considering a one-story trade and vocational school to cost about $45,000 with equipment.

Milwaukee

MILWAUKEE, June 30.—Machine tool business reached its lowest ebb in several years during June, but a tone of hopefulness is reflected in more active inquiry and the knowledge that a substantial volume of business is in the foreground awaiting release when business improves. Current demand is restricted to urgent needs, many orders coming from more widely diversified sources. Export demand is fair. The call for used equipment is rather slow.

Drawn Steel Tube Co., Appleton, Wis., has been organized with an initial capitalization of $25,000 to take over and operate Appleton Steel Tube Co., which suspended in December. W. B. Markham, formerly of Chicago, will be active in the management.

Charles H. Stehling Co., 401 Fourth Street, Milwaukee, manufacturer of tannery equipment, has acquired business of Dependable Harvester Corporation, Milwaukee, manufacturer of walking type farm and garden tractors and portable power-driven machine for topping beets, carrots, etc. Stanley Plazek, designer of machines and head of Dependable company, has become associated with Stehling organization.

Fox River Boiler Works, 701 South Bounds Street, Appleton, Wis., is building a one-story shop extension, 30 x 64 ft., and will buy tools for boiler repair, structural steel and sheet metal processes.

R. J. Schwab & Sons Co., 283 Clinton Street, Milwaukee, manufacturer of cast-iron furnaces and other heating equipment, has been reorganized as Schwab Furnace & Mfg. Co. and is taking over plant and business of Cedar Grove Stove Co., Cedar Grove, Wis. Works are being reconditioned and new foundry is being erected at cost of $50,000. New company will do jobbing foundry business in addition to supplying castings for furnace department. Part of Milwaukee property has been sold to Wisconsin Gear & Engineering Co., 251 Reed Street, and remainder will be used by Schwab company as sales offices. Henry E. Schwab is president.

Green Bay Welding Co., 301 North Jefferson Street, Green Bay, Wis., has purchased site at Monroe and Cedar Streets and will break ground at once for first unit, 45 x 100 ft., of new welding shop.

International Wire Works, 433 Sixth Street, Menasha, Wis., manufacturing paper and pulp mill screens and other wire specialties, has plans by Orbison & Orbison, consulting engineers, Appleton, Wis., for extension costing about $75,000 with equipment.

Hartford Steel Car Co., Hartford, Wis., has been organized by Daniel L. McWilliams, 123 Wisconsin Avenue, Milwaukee, to manufacture special all-steel rolling stock. Site of 20 acres has been acquired and first unit, 70 x 120 ft., of new plant will be started July 1. Equipment to be purchased includes one 5-ton electric traveling crane.

Kerner Incinerator Co., 641 East Water Street, Milwaukee, manufacturer of domestic and industrial waste reduction units, has acquired an existing plant at 1577 Richards Street, Milwaukee, and after remodeling will transfer operation, gaining about twice present floor space. Considerable new equipment will be required. Mackey Wells is president and general manager.

Gulf States

BIRMINGHAM, June 30.—Tower City Packing Co., Lake Wales, Fla., W. Keen, president, has awarded general contract to Gifford & Simmons, Frostproof, Fla., for one-story packing plant, 92 x 120 ft., including conveying, loading and other mechanical equipment, to cost $50,000.

Pensacola Metal Aircraft Corporation, Pensacola, Fla., recently organized by P. L. Pierce, American National Bank Building, and associates, is considering establishment of airplane manufacturing plant, including parts and assembling departments.

City Commission, Denton, Tex., is asking bids until July 14 for ice-making machinery and auxiliary equipment for proposed municipal ice-manufacturing plant.

Birmingham Auto & Machine Co., Second Avenue South and Twenty-fourth Street, Birmingham, is considering installation of additional equipment for manufacture of pick and axe handles, etc.

Southern Kraft Corporation, 466 Michigan Avenue, Mobile, Ala., a subsidiary of International Paper Co., 100 East Forty-second Street, New York, has awarded contract to Stupp Brothers Bridge & Iron Co., St. Louis, for initial units of paper mill at Panama City, Fla. A power house with capacity of 13,400 hp. will be built. Entire project will cost over $2,500,000 with machinery.

Texas & Pacific Railway Co., Houston, Tex., has superstructure nearing completion on group of 13 shop units at Big Spring, Tex., and plans early installation of machinery. Project will cost over $150,000 and is scheduled for completion in September. A new power plant will be installed.

Central Power & Light Co., San Antonio, Tex., is considering new hydroelectric power plant at Lake Lovenskiold on Nueces River, with initial capacity of 20,000 kw., to cost over $750,000 with transmission system.

J. M. Burguieres Co., Ltd., 827 Union Street, New Orleans, is considering rebuilding part of cane sugar mill near Franklin, La., recently destroyed by fire, with loss over $350,000 including machinery.

East Baton Rouge Police Jury, East Baton Rouge, La., has rejected bids recently received for hangars and other buildings for municipal airport, including shop and reconditioning unit, and will ask new bids soon. Jones, Roessle & Olschner, Maison Blanche Building, New Orleans, are architects.

Texas Utilities Co., Plainview, Tex., has approved plans for steam-operated electric power plant at Abernathy, Tex., to cost about $150,000 with equipment.

Board of Trustees, Montgomery Consolidated School System, Duck Hill, Miss., has plans for a new one-story vocational shop, to cost about $35,000 with equipment.

Charles P. Limbert Co., Laurel, Miss., manufacturer of furniture, will take bids at once on general contract for new plant to cost over $150,000 with machinery. Edward Freeback, Laurel, is architect.

List Construction Co., Alkine, Tex., has bought a 25-ton, eight-wheel, gasoline-operated, standard gage locomotive crane from Orton Crane & Shovel Co.

Cleveland

CLEVELAND, June 30.—The machine tool market continues almost lifeless. Business during the last half of June was lighter than in the first half and the volume of sales for the month showed some falling off as compared with May. Metal-working plants have not increased operations, and there is an absence of interest in new equipment in all metal-working industries. Neither is any business coming from railroads in this territory. Equipment of three machine shops in this district sold at auction the past week brought low prices. Throwing this equipment on the market tends to curtail sales by dealers. There is nothing in the situation to indicate a better volume of business in July, and the trade doubts if there will be a revival before September.

Harshaw Chemical Co., 1945 East Ninety-seventh Street, Cleveland, has plans for a one-story foundry, 86 x 130 ft., at Newburg plant, to cost about $45,000 with equipment. Company will also build a one-story extension to local plant. Mark Swisher, 5927 Euclid Avenue, is engineer.

Detroit, Toledo & Ironton Railroad Co., Laskey Road, Toledo, Ohio, is planning extensions and improvements in engine house and shops, including installation of additional equipment, to cost over $60,000.

City Ice & Fuel Co., 6611 Euclid Avenue, Cleveland, has approved plans for new ice-manufacturing and cold storage plant at Pittsburgh to cost over $600,000 with machinery. Company has work under way on a new car-icing plant at Toronto, Ont., to cost about $500,000 with equipment. A similar plant is also in progress at St. Albans, Vt., to cost $150,000.

Ohio Oil Co., Findlay, Ohio, has purchased Transcontinental Oil Co., 111 Broadway, New York, with main properties in Texas, and will consolidate. Combined organization will have assets totaling $225,000,000, and acquiring company plans expansion in production and distributing facilities, including pipe lines.

Cleveland Co-Operative Stove Co., 2323 East Sixty-seventh Street, Cleveland, has acquired plant and property of Buckeye Incubator Co., Springfield, Ohio, at a receiver's sale, and plans removal to Cleveland plant, which will be extended

Pacific Coast

SAN FRANCISCO, June 26.—Edison Electric Appliance Co., Ontario, Cal., manufacturer of electric heating appliances, a subsidiary of General Electric Co., is planning an addition, primarily for production of electric ranges, including parts and assembling departments, to cost about $1,000,000 with equipment. George A. Hughes is president.

Modesto Ice Delivery Co., Modesto, Cal., a subsidiary of Fresno Consumers Ice Co., Fresno, Cal., is planning new ice-manufacturing and refrigerating plant, to cost about $100,000 with machinery.

Board of Education, Salt Lake City, Utah, plans installation of manual training equipment in new high school to cost over $700,000, for which general contract has been let to James J. Burke Construction Co., Kearns Building.

Crown-Zellerbach Corporation, 343 Sansome Street, San Francisco, operating pulp and paper mills, in cooperation with George T. Cameron, head of *San Francisco Chronicle*, has applied for license to construct and operate a hydroelectric power plant on Long, Crater and Dorothy Lakes, near Juneau, Alaska. Station will have initial capacity of 81,000 hp., and will cost over $3,500,000 with transmission lines.

Albatross Steel Equipment Co., 733 South Figueroa Street, Los Angeles, manufacturer of metal furniture, partitions, cabinets, etc., is considering one-story branch assembling plant at Seattle, to cost about $30,000 with equipment.

Northern Flour Mill, Walla Walla, Wash., is considering rebuilding part of mill destroyed by fire June 18, with loss close to $200,000 with equipment.

Trade Dollar Consolidated Mining Co., Silver City, Idaho, Willard White, superintendent, has plans for hydroelectric power plant at Swan Falls on Snake River, to cost about $230,000 with transmission lines. A. J. Wiley is chief engineer.

City Council, Walla Walla, Wash., is planning establishment of municipal airport near city limits, including hangar, repair and reconditioning shop and other field units, to cost $50,000, in which amount bonds have been approved. Carey Strome and Morris Hill are head of committee in charge.

Board of City Commissioners, Brigham City, Utah, has plans for an addition to municipal electric power plant, including installation of additional equipment.

Crager Wire & Iron Works, Salt Lake City, Utah, has moved to new plant at 34 East Ninth South Street, that city.

Canada

TORONTO, June 30.—McIntyre Porcupine Mines, Ltd., Schumacher, Ont., has plans for a 2000-ton mill to replace present 1500-ton mill, to cost about $1,300,000. Construction will start at once.

Falconbridge Nickel Mines, Ltd., head office, Concourse Building, Toronto, has plans for one-story addition, 80 x 140 ft., to smelter at Falconbridge, Ont., to cost $25,000.

Canadian Potteries, Ltd., has awarded general contract to Anglin-Norcross, Ltd., 892 Sherbrooke Street West, Montreal, for one-story plant, 100 x 100 ft., at St. Johns, Que., for manufacture of bathroom fixtures, to cost $400,000. Ross & Macdonald, 602 Belmont Street, Montreal, are architects.

Universal Button & Fastener Co., Walker Road, Walkerville, Ont., has let contract to Allan & Earl, Ltd., Equity Chambers, Windsor, Ont., for one-story factory, 60 x 170 ft., to replace building recently destroyed by fire, to cost about $15,000.

Town Council, Courtright, Ont., contemplates purchasing electrical-driven pump for waterworks plant. R. G. Stewart is clerk.

Canadian White Pine Lumber Co., South Vancouver, B. C., will start work immediately to rebuild sawmill recently destroyed by fire. New mill will cost $50,000.

Foreign

OFFICIALS of Westinghouse Electric & Mfg. Co., East Pittsburgh, and its foreign subsidiary Westinghouse Electric International Co., have organized Constructors Nancional Maquinaria Electrica, capitalized at 12,000,000 pesetas (about $1,500,000), to operate in Spain. New company will specialize in manufacture of electric generators, motors, transformers and other heavy electric power equipment, and has taken over Electro Mecanicas, with exception of its copper interests, and existing plant at Cordoba. Site has also been acquired at Reinosa for large plant on which work will begin soon. Company will be operated in close cooperation with Le Material Electrique S-W., Paris, France, recently organized as a Westinghouse interest to operate in that country.

Ford Motor Co., Dearborn, Mich., through Ford Motor Co. of England, London, is negotiating with Isotta-Fraschini Co., Rome, Italy, manufacturer of automobiles, for organization of Ford company to operate in last-noted country, establishing plant for parts manufacture and assembling of Ford automobiles and motor trucks. Both companies will be interested in new enterprise. Ford Co. of England has work under way on new plant at Dagenham, England, on Thames River, to have annual output of 200,000 cars, scheduled for completion in 1931, to cost over $7,500,000 with machinery. German Ford Co., Berlin, also has construction in progress on assembling plant at Cologne, for daily output of 120 automobiles.

Officials of Underwood Elliott Fisher Co., 342 Madison Avenue, New York, manufacturer of typewriters, bookkeeping, billing, calculating and other machines, have organized Underwood Italiana, with headquarters at Milan, Italy, to operate as direct factory branch and distributing interest in that country. New company is capitalized at $1,000,000 and will establish plant at once.

Department of Public Works, Paris, France, plans development of Government-owned nitrogen works at Toulouse, to cost 140,000,000 fr. (about $5,460,000). A bill is now in Parliament for appropriation in that amount, of which 50,000,000 fr. (about $1,950,000) will be used for purchase of new machinery for expansion in present ammonium sulphate works, while 90,000,000 fr. (about $3,510,000) will be given over to erection of new plant on adjoining site for production of nitric acid.

New Trade Publications

Chain.—American Chain Co., Bridgeport, Conn. Folder provides specifications, test and safe working loads on "Ajax" steel loading chain, made with a long, lapped, swelled weld and intended to pull stiff before breaking.

Stroke Counter.—Durant Mfg. Co., 655 Buffum Street, Milwaukee. Folder on improved "Productimeter" for stroke counting, constructed to be proof against tampering.

First Aid.—Metropolitan Life Insurance Co., 1 Madison Avenue, New York. A 20-page booklet prepared to assist establishment of first aid service in industrial plants employing less than 500 persons. The booklet is illustrated with photographs of first aid rooms maintained by certain industrial concerns and contains information on the construction and equipment of such rooms, as well as a discussion of the personnel necessary. An appendix gives an outline of the laws governing first aid in the various States.

Shears.—Alfa Machine Co., McKinley and Fourth Streets, Milwaukee. Bulletin No. 131 describes motor-driven and hand-operated shears for use in cutting drawing paper, tracing cloth, blue prints, cardboards and textiles. They may be operated at 120 strokes per minute and are furnished in standard sizes of 30, 42 and 54-in. cutting widths.

Perforated Metal Grilles.—Diamond Mfg. Co., Wyoming, Pa. Bulletin of two pages describing metal grilles, offered in sizes up to 50 x 120 in., and plain lattice designs, 3/16, ¼ and 5/16 in. in thickness. Metals used include steel, brass, bronze, copper, commercial bronze, manganese bronze, aluminum and nickel silver.

Gas and Oil Burners.—Lee B. Mettler Co., 406 South Main Street, Los Angeles. Catalog of 28 pages of filing size. In addition to a price list, it includes 19 pages of drawings showing typical installations of the company's equipment and the principles on which it operates.

Cork.—Armstrong Cork Co., Lancaster, Pa. Booklet of 48 pages describing the special characteristics of cork and illustrating numerous uses for the product. The chief properties of cork are listed as resistance to liquid penetration, compressibility, resilience, frictional quality, buoyancy, low thermal conductivity, chemical inertness and stability. Photographs of cork which has undergone special tests for these qualities are included, as well as numerous illustrations of equipment in which cork is used, such as gasket cushioning, polishing machinery, transmission of power in driving, drawing or braking, closures and seals for anti-friction bearings and insulation. Metal-working machines in which cork is being used include electric mortisers, die cutters, valve grinders, presses and metal grinders.

Spot Welder.—American Electric Fusion Corporation, Chicago. Bulletin No. 50 describes methods of increasing production with A. E. F. (P. D. type) spot welder, an automatic machine capable of one weld a second—the maximum rate it can be fed.

Railroad Crossings.—American Manganese Steel Co., Chicago Heights, Ill. Folder describing new process railroad crossings, wherein the riding surfaces of the rails at the intersections are cast slightly high, and are forged down to level, thus giving them the preliminary work-hardening which insures against further wear.

Commercial Nitriding.—Wesley Steel Treating Co., Milwaukee. Booklet 6, giving a dramatized story about the desirability of hardening machine parts by the nitriding process.

Structural Welding.—Westinghouse Electric & Mfg. Co., East Pittsburgh. Special publication 1767, describing the manufacture and test of a large variety of structural joints, such as would be used in factory or tier buildings.

Pulverized Coal Burner.—Ashmead-Danks Co., Cleveland. Eight-page folder describing "A and D" adjustable orifice burner, in four sizes from 12 to 39 in. opening and with capacity from ½ ton to 20 tons of pulverized coal per hour.

Iron Sheets.—American Rolling Mill Co., Middletown, Ohio. Two small folders featuring "Armco" ingot iron for sheet metal work in refrigerator cars and for locomotive jacket sheets. The folder on locomotive jackets includes a list of the gages carried in stock by the company.

Casters.—Colson Co., Elyria, catalog No. D 195, 72 pages. Describes and illustrates numerous types of casters for industrial and other uses, ranging from small sizes to casters with wheels up to 10 in. in diameter. Included are ball-bearing swivel casters, casters with cast iron, cast aluminum and forged steel wheels, and with aluminum as well as rubber tires.

Carborundum Brand Green-Grit Wheels.—Carborundum Co., Niagara Falls, N. Y. Pamphlet of 32 pages, devoted to problems connected with grinding cemented tungsten-carbide tools. The green-grit wheel has been developed especially for this purpose. Instructions and information are given covering many features of grinding on these extremely hard materials.

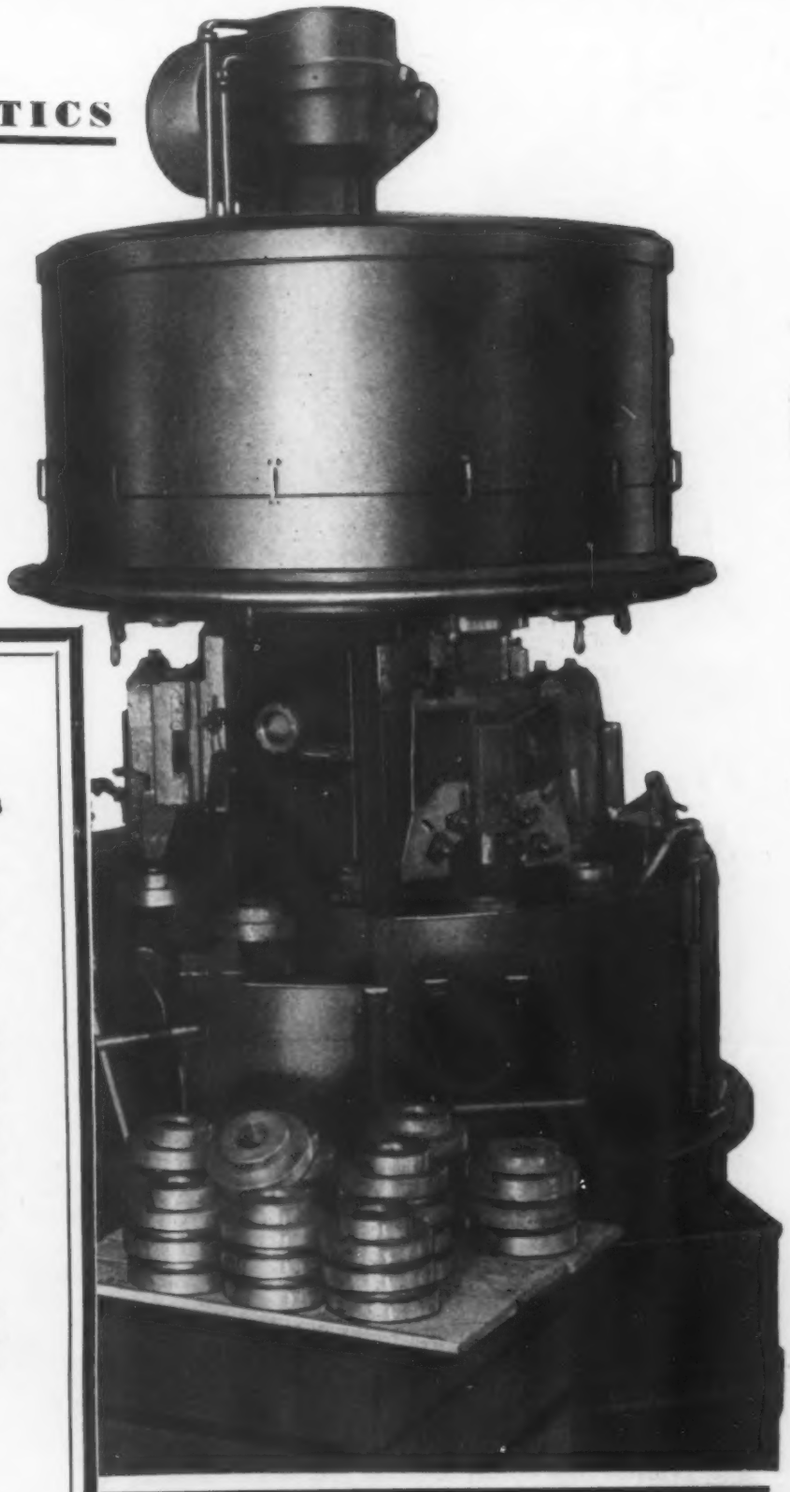
Industrial Painting.—Article in the Ferguson *Cross-Section*, published by the H. K. Ferguson Co., Hanna Building, Cleveland, entitled "The Right Paint Is the Only Cheap Paint," outlines methods of painting structural steel, wood roofs, brick sidewalls and other parts of industrial plant buildings.

The Gray Iron Institute, Cleveland, is taking on an international character by the enrollment of foreign members. Recently T. Main & Sons, Property, Ltd., East Melbourne, Victoria, Australia, applied for membership and was enrolled in the organization. Previously the Porto Rico Iron Works, Inc., Ponce, Porto Rico, became a member. Some of the Canadian foundries are members also.

Effective July 1, the industrial heating and welding section of the industrial department, General Electric Co., was divided into two sections. C. L. Ipsen is manager of sales of the industrial heating section and L. D. Meeker is manager of sales of the electric welding section.

MULT-AU-MATICS

BULLARD



Machining For Tomorrow's Profits

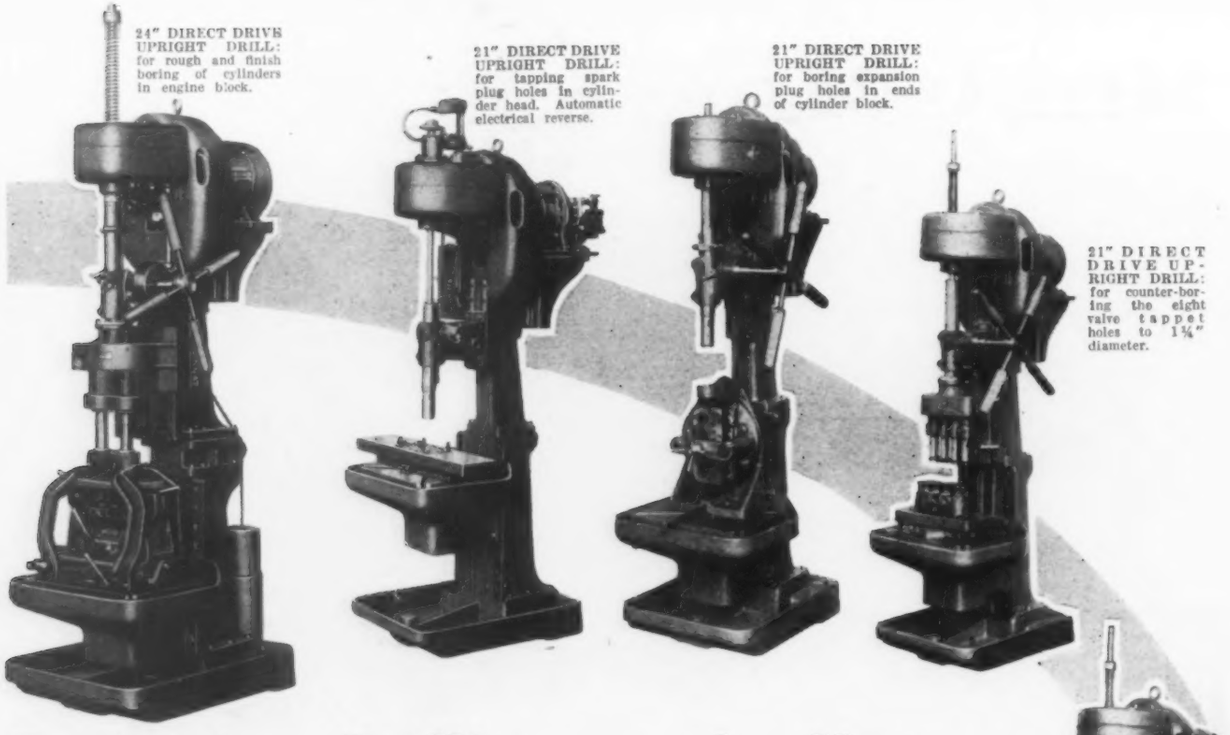
is a hopeless task with the machines of yesterday. Shop equipment that fails to keep up with production schedules is profitless.

Mult-Au-Matics will always maintain a profitable lead over the most exacting schedules you may have regardless of whether it is production of small lots or long runs. One Mult-Au-Matic will replace a whole battery of slow moving, attention demanding, hand chucking machines.

Better let a Bullard engineer give you the facts. A request will bring him to you.

The BULLARD COMPANY

Bridgeport, Conn.



24" DIRECT DRIVE UPRIGHT DRILL: for rough and finish boring of cylinders in engine block.

21" DIRECT DRIVE UPRIGHT DRILL: for tapping spark plug holes in cylinder head. Automatic electrical reverse.

21" DIRECT DRIVE UPRIGHT DRILL: for boring expansion plug holes in ends of cylinder block.

21" DIRECT DRIVE UPRIGHT DRILL: for counter-boring the eight valve tappet holes to 1¼" diameter.

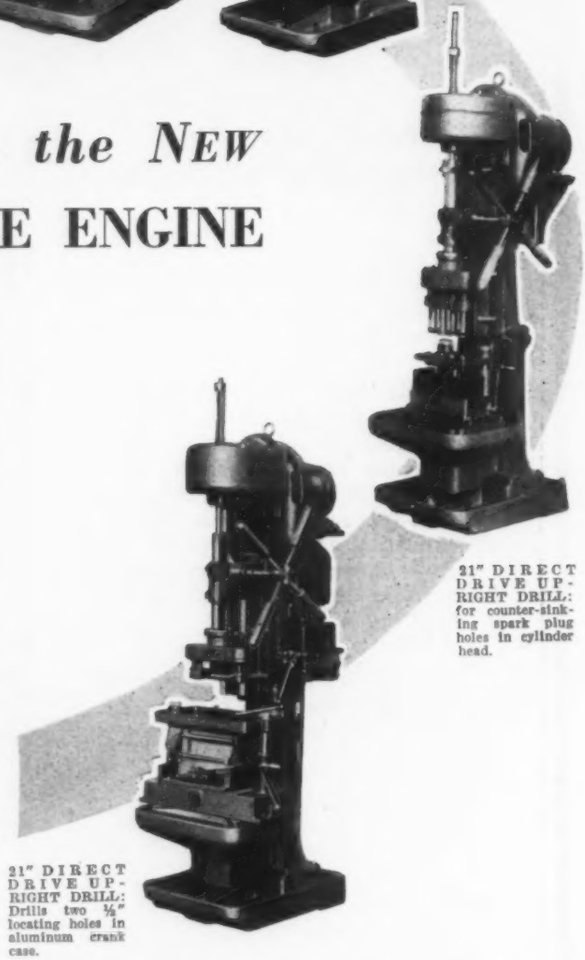
Production Drilling on the NEW AUSTIN AUTOMOBILE ENGINE

The Austin—new to America, but well known in many foreign countries—has a background of remarkable performances for a car of its size and weight. In England, one was driven 200 miles at 83 miles per hour—in France, one averaged 64.75 miles per hour for 24 hours—in Australia, 250 miles, 54.8 miles per (imperial) gallon—won hill climbing contests in Spain and South Africa.

To produce cars with these same remarkable qualities for American motorists the American Austin Car Company selected Cincinnati Bickford Direct Drive Drills for many of their drilling, boring and tapping operations. The motor, which is considerably smaller than other automobile engines made in this country, is tooled up for production in a simple but effective manner.

The Austin Company and hundreds of leading manufacturers select Cincinnati Bickford because they readily meet the demands of modern production.

To fully understand just how the Direct Drive Drill may be adapted to suit your work, write for Booklet U-15A.



21" DIRECT DRIVE UPRIGHT DRILL: for counter-sinking spark plug holes in cylinder head.

21" DIRECT DRIVE UPRIGHT DRILL: Drills two ½" locating holes in aluminum crank case.

The CINCINNATI BICKFORD TOOL CO.

OAKLEY, CINCINNATI, OHIO

Power applied direct

THE old idea of applying power to the cutting tools through a detour of gears, shafts and belts has been eliminated in the Putnam Planer Type Milling Machine. Each head is actuated by its own motor (either constant or multi-speed) which supplies power direct to the spindle.

The speed of the cutter may be adjusted to the work at hand. Tooling up is done more quickly. Less power is consumed and the hazard of breakdown of power transmission units is enormously lessened. The machine maintains its accuracy—yet is flexible.

1 or 4 motor spindle speeds obtainable. Spindle speeds varied 25% up or down, through the medium of "pick-off" gears.

Let us send you full information about this very efficient Putnam machine tool.

PLANERS
Open Side,
Double Housing

BORING MACHINES
MILLING MACHINES
DRILLING MACHINES

•

HEAVY DUTY
MACHINE TOOLS
For Industrial and Railroad Shop Service

•

SPECIAL PURPOSE MACHINES

Manufactured at

PUTNAM MACHINE WORKS, Fitchburg, Mass.

Owned by

MANNING, MAXWELL & MOORE, Inc.

General Offices: 100 E. 42nd St., New York City

Branches: Chicago Detroit Philadelphia St. Louis

Representatives:

Arch Machinery Co. 1005 Park Bldg., Pittsburgh, Pa.
Smith Booth Usher Co. 228 Central Ave., Los Angeles Cal.
International Equipment Co., Ltd. Royal Bank Bldg., Montreal, Canada

MANNING, MAXWELL & MOORE, Inc.

Excuse us again please

We must ask you again to turn the page to study the inside of the P & W Model B Lathe carriage. It was the only way to show you as much detail as possible.

STUDY the photo-drawing below and the illustration on the opposite page. They will show you clearly the many details which have made the Model B Lathe carriage so successful. We have labeled its various parts so you can analyze them easily.

A Model B Lathe carriage is strong without being cumbersome. It is accurate to fine limits as are all Pratt & Whitney products. It is convenient, because it is designed so that everything is within easy reach.

A *quick-withdrawing attachment* for thread cutting is built into every Model B Lathe. It is the modern way to cut threads. There is a coarse screw (number five in the illustration) that jumps the tool out of the thread when the cut is finished. It needs only a quarter turn to do it instead of several. Once you have used this *quick-withdrawing attachment* you'll never want to bother with the old way again. And the *built-in thread chasing dial* (number twenty-one) is a real convenience for finding the start of a thread easily, or for cutting multiple threads.

Space will not permit many details here, but we will be glad to send you the complete story of Model B Lathes. Just fill out the coupon below. You will receive an interesting book which contains many important lathe developments you should know about.

PRATT & WHITNEY CO.
Hartford, Conn.

This photo-drawing of the Model B Lathe carriage shows its internal construction. Notice the deep bridge design which makes for rigidity and maintains accuracy under all conditions. The carriage is gibbed, and runs on one V and one flat way which insures proper alignment.

Look Into This

P & W Model B Lathes are built in three sizes 13"-16"-20". This is the 20" lathe.

Model B Lathe Carriage

A Model B Lathe carriage is exceptionally free running. This is because of the type of ways used which maintain alignment, the wipers and oilers on the ways, and the high degree of accuracy with which the lathe is assembled. You can slide a Model B Lathe carriage back and forth easily by hand without using the handwheel. Try it yourself.

1 Compound slide handwheel elevated at an angle for knuckle clearance.
2 Large micrometer dial graduated to read directly to thousandths on diameter.
3 Lock to hold dials in any desired position.
4 Quick-withdrawing attachment for thread cutting.
5 Coarse feed screw for quick withdrawing during thread cutting.
6 Large spur gears deliver power for cross feed.
7 Cross feed screw and nut.
8 Cross slide binder.
9 Deep "bridge" construction of carriage.
10 Connection for taper attachment.
11 Cross feed handwheel.
12 Conventional style threading stop.
13 Carriage binder.
14 Felt wipers and oilers on all slides.
15 Longitudinal handwheel.
16 Longitudinal power feed knob.
17 Longitudinal handwheel release.
18 Cross power feed knob.
19 Lead screw nut lever.
20 Apron control to main drive.
21 Built-in thread chasing dial.
22 Carriage feed reverse lever.

Branch Offices:
BIRMINGHAM BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT LOS ANGELES
NEW YORK PHILADELPHIA PITTSBURGH ROCHESTER SAN FRANCISCO ST. LOUIS

Fill Out This Coupon Today

Pratt & Whitney Co., Hartford, Conn.
Please send me the Model B Lathe Circular.

Name _____
Title _____
Company _____
Address _____
City & State _____

KINNEAR ROLLING DOORS
—as usual

Graham, Anderson, Probst & White, Architects

AT THE NEW CLEVELAND UNION TERMINAL

FOR over twenty-five years Kinnear Rolling Doors have been demonstrating their efficiency and eminently satisfactory performance in nearly all the great terminals of the country. It was but logical, therefore, that they should have been selected for the baggage room of the magnificent new Cleveland Union Terminal.

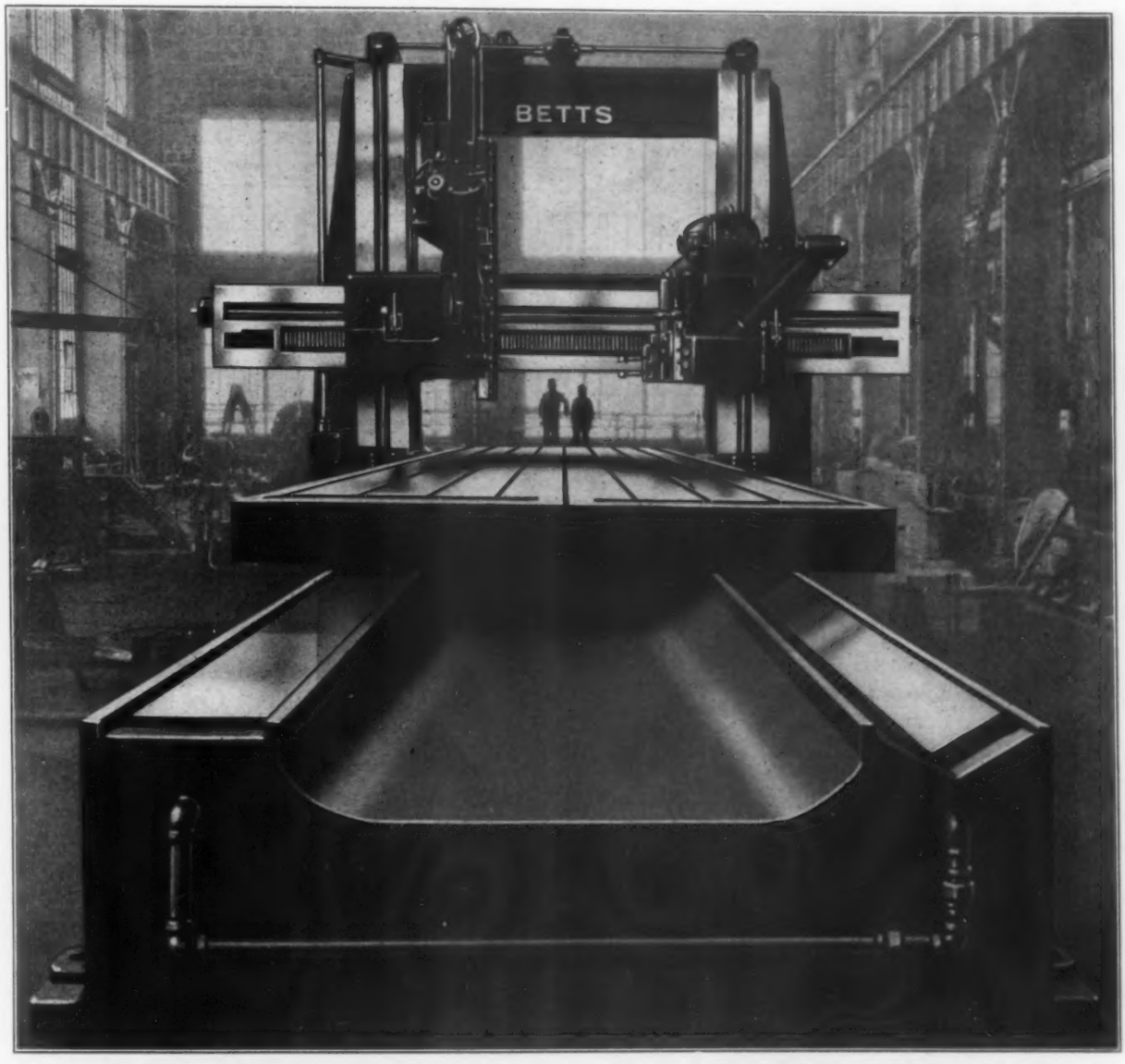
At the touch of an electric button they glide up and down —conserving valuable time and space—giving the utmost in door efficiency. When planning new, or the improvement of existing structures do not overlook their many advantages. Literature and estimates furnished without charge or obligation.

THE KINNEAR MANUFACTURING CO.
817-867 Field Avenue, Columbus, Ohio, U. S. A.

Boston Chicago Cincinnati Cleveland Detroit New Orleans
New York Philadelphia Pittsburgh Kansas City Washington

kinnear
ROLLING DOORS

BACK AND FORTH
UP AND DOWN
IN AND OUT



BACK and Forth goes the 60′ table.
Up and down goes the swivelling slotting head.
In and out goes the cross planing head.
What a number of operations possible on this machine.

This is only one example of Consolidated ingenuity in solving machining problems in the simplest and most effective way. Perhaps some of your work can be done easier, faster and more economically.
Consult CONSOLIDATED.

BETTS-NEWTON-COLBURN-MODERN-HILLES & JONES

CONSOLIDATED

CONSOLIDATED MACHINE TOOL CORPORATION *of* AMERICA, Rochester, N. Y.

It is with Great Pleasure that We Announce the Purchase of the

COCHISE
ROCK DRILL MFG. CO.

LOS ANGELES, CALIFORNIA

The Manufacturers of the Famous COCHISE Rock Drills

This linking together of two great names in the Pneumatic Tool industry — THOR and COCHISE — is in direct line with the policy of the Independent Pneumatic Tool Co., which is to provide users with the highest quality tools.

Cochise Rock Drills have established an enviable reputation in the mining and construction fields of the West. They have repeatedly won highest honors in the Drilling Contests which are held in the West every few years, in proving to be the fastest cutting, most efficient and economical rock drills.

THOR Pneumatic and Electric Tools are considered the standard in all lines of industry where production methods are essential. Their design and construction have withstood the test of time and the number of prominent firms that have standardized on THOR Tools is a wonderful tribute to their supremacy.

The Cochise Rock Drill Mfg. Co. will operate as a unit of the Independent Pneumatic Tool Co. There will be no change in personnel or methods. It is our desire to extend the field of service for Cochise Rock Drills to all parts of the country so that all industries will be able to take advantage of the speed, power and economy of Cochise Drills.

We welcome this opportunity to serve a greater clientele in the mining and construction fields and pledge ourselves to the task of upholding the high reputation that Cochise Rock Drills have established.

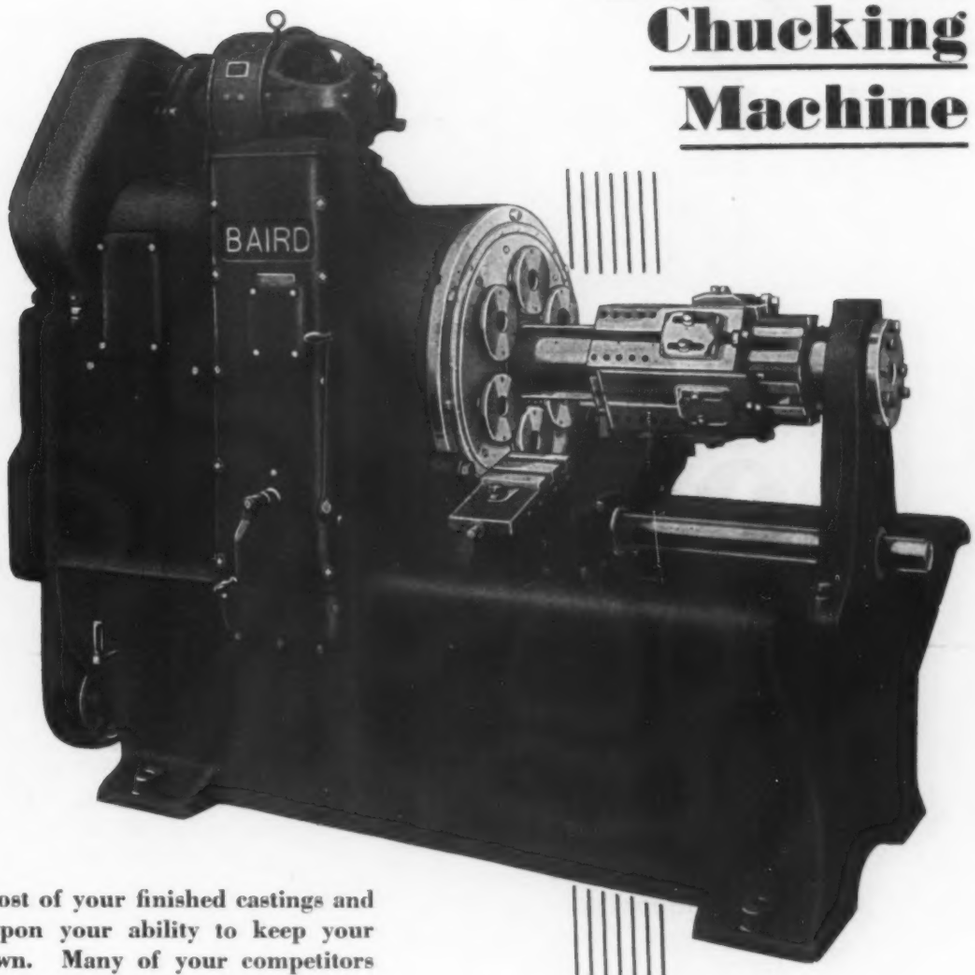
INDEPENDENT PNEUMATIC TOOL CO.

NEW YORK 600 West Jackson Boulevard LONDON
CHICAGO, ILL.

PNEUMATIC TOOLS ··· ELECTRIC Thor TOOLS ··· AIR COMPRESSORS

BAIRD

Horizontal Chucking Machine



THE cost of your finished castings and forgings depends upon your ability to keep your machining costs down. Many of your competitors are using BAIRD Horizontal Chucking Machines—increasing production and doing better work for less money.

Why lose your share?—BAIRD can help you, too.

Designed for high production machining of castings and forgings up to seven inches in diameter, this six spindle machine operates on five pieces of work at one time. High speed at one station, low speed at another, or the revolution of a spindle may be stopped to bore one or more holes off-center. 21 tools may be used at one time.

Magazine feeds, cross drilling, milling, turning, facing, chamfering, boring, reaming, threading, and other lathe work.

THE BAIRD MACHINE CO.

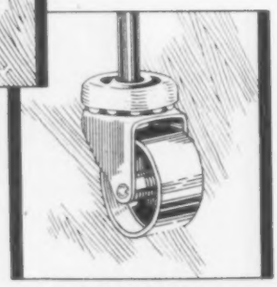
BRIDGEPORT, CONNECTICUT

AUTOMATIC BAIRD MACHINERY

"Ask BAIRD About It"

THERE'S AN OAKITE SERVICE MAN NEAR EVERY INDUSTRIAL PLANT

ILLINOIS



CALIFORNIA

This Advertisement is one of a series based on actual occurrences n. n.

PENNSYLVANIA

Use this

NATION-WIDE OAKITE *cleaning service!*

IN an Illinois plant Oakite materials gave perfect results in cleaning steel stools and thermos jugs before spray painting. Thinking to save money, they tried a cheaper material, but found it required an additional gasoline dip and two hand brushing operations, all of which did not equal the cleanliness obtained with the Oakite material in one short soak and a rinse. Now they are back on Oakite to stay!

A California manufacturer finds that Oakite materials speed his cleaning, just as his casters speed the movement of the objects to which they are attached. Oakite Platers Cleaner is used to remove slushing oil and dirt from parts of casters that are to be plated. In the machine shop, Oakite Cutting Compound on lathes has been found to be a superior coolant and lubricant, which at the same time keeps work clean and rust-proof.

A Pennsylvania plant saves $10.00 a day by using Oakite materials in tumbling tire chains before plating. They formerly tumbled with soda ash. And where they previously used 500 barrels of the former material, they now require only 50 barrels of Oakite. Certainly a worthwhile saving in handling, freight and storage, as well as cost of material!

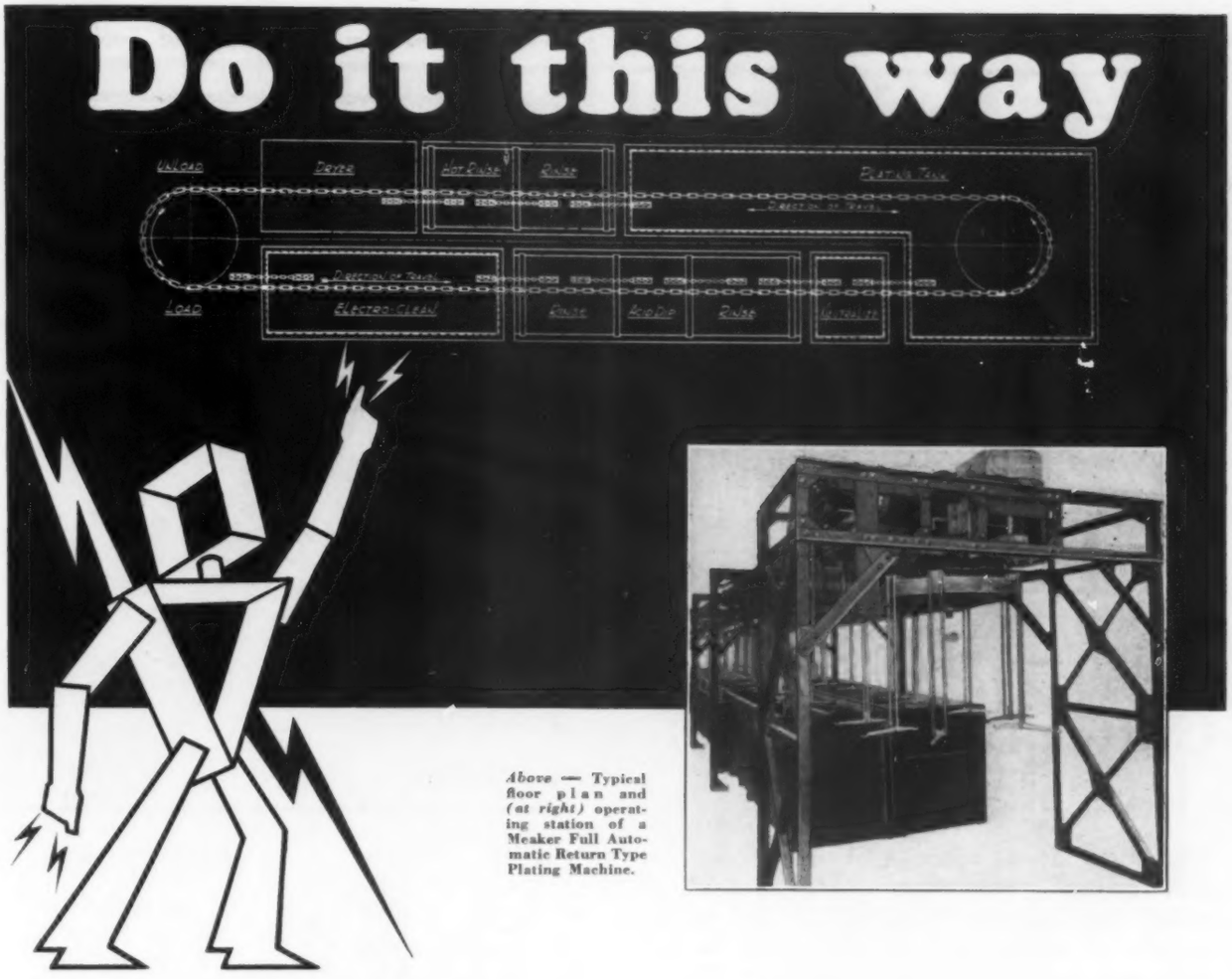
For all cleaning, and for related operations, such as cutting, grinding, rust-proofing, and paint-stripping, use Nation-wide Oakite cleaning service. Available everywhere, and equal to the most difficult cleaning task! Send for booklets on Modern Metal Cleaning, and Modern Cutting and Grinding.

OAKITE PRODUCTS, INC.
20 Thames St., New York, N.Y.

OAKITE
Industrial Cleaning Materials and Methods

THERE'S AN OAKITE MATERIAL FOR EVERY KIND OF CLEANING

Do it this way



Above — Typical floor plan and *(at right)* operating station of a Meaker Full Automatic Return Type Plating Machine.

IF you are in the plating business—either as a jobbing shop or operating a plating department in your plant, you'll be interested in Meaker Full Automatic Plating Machines because they make money for you "hand over fist." They *pay for themselves practically from the start*—do things right—speed production—save labor—cut costs—and *increase net profits.* On one recent installation they cut costs 89%.

The above floor plan is taken from a Meaker Full Automatic Return Type Plating Machine in actual use at the plant of a large hardware manufacturer, where, with the attention of *one* man to load and unload racks, it electro cleans, dips, plates, and dries 125,000 pieces of miscellaneous parts every 8½ hour day.

Carefully follow the sequence of operations—every transfer from tank to tank is automatic—materials remain in solution for the exact predetermined time and every piece is delivered to the operator with its exact thickness of metal coating—something that can be accomplished only with automatic equipment.

Get complete facts on Meaker Automatic Plating Machines. Use the coupon below.

THE MEAKER COMPANY

1619 SOUTH 55TH AVENUE,
(CICERO STATION)
CHICAGO, ILLINOIS

THE MEAKER CO.,
1619 S. 55th Ave. (Cicero Sta.), Chicago, Ill.
Please send complete information on Meaker Full Automatic Return Type and Straight-A-Way Plating Machines.

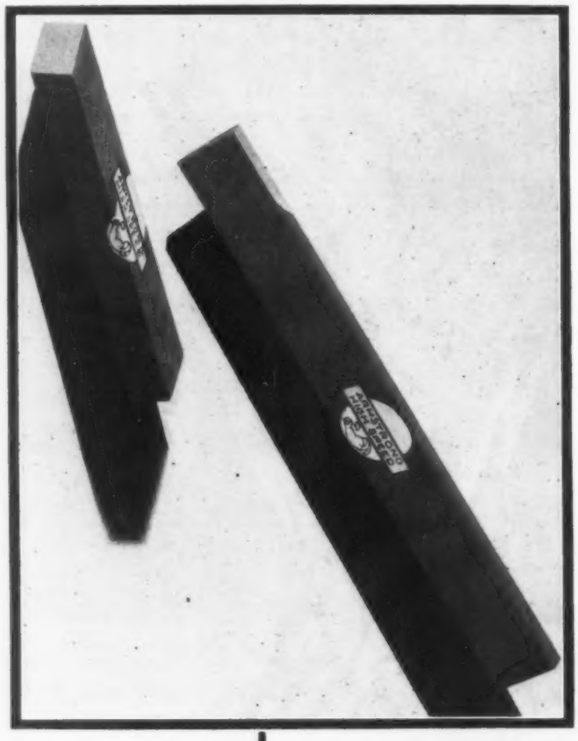
Name .....

Address .....

MEAKER FULL AUTOMATIC PLATING MACHINES

Pin to Your Letterhead and Mail

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



Fine Tools in the rough—ARMSTRONG Cutter Bits and Blades

With the universal adoption of the Armstrong System of Tool Holders, steel companies everywhere supply, as standard shapes, lengths of High Speed Steel to fit ARMSTRONG Tool Holders. While it is unquestionably an advantage to machinists to be able to buy anywhere high speed steel in the proper forms for cutter bits and blades, it is not always the best policy to do so. The working efficiency of any tool holder depends to a marked degree on the quality of the bit used and in view of the small amount of steel actually consumed in a tool bit, it is a false economy to use bits made from run-of-the-mill steels produced on a tonnage basis.

ARMSTRONG HIGH SPEED

This decalcomania marks each ARMSTRONG Bit and Blade.

Remember the words, "ARMSTRONG HIGH SPEED."

ARMSTRONG Bits and Blades assure greatest efficiency from ARMSTRONG Tool Holders for they are more than shapes of High Speed Steel. Each is a fine tool in the rough, the product of long and specialized experience, special furnaces and special equipment and processes. It is sound business to insist on ARMSTRONG Bits and Blades.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
309 N. Francisco Ave., CHICAGO, U. S. A.

ARMSTRONG

Tool Holders
"C" Clamps Lathe Dogs
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Chain Pipe Wrenches
Pipe Wrenches

ARMSTRONG BROS.

Solid Dies and Stocks
Adjustable Dies and Stocks
Ratchet Stocks
Triplex Stocks
Pipe Cutters
Chain Vises
Hinged Pipe Vises
Knife Blade Cutter Wheels

WRITE for Catalog E-27. Shows, describes and prices all ARMSTRONG Tools.

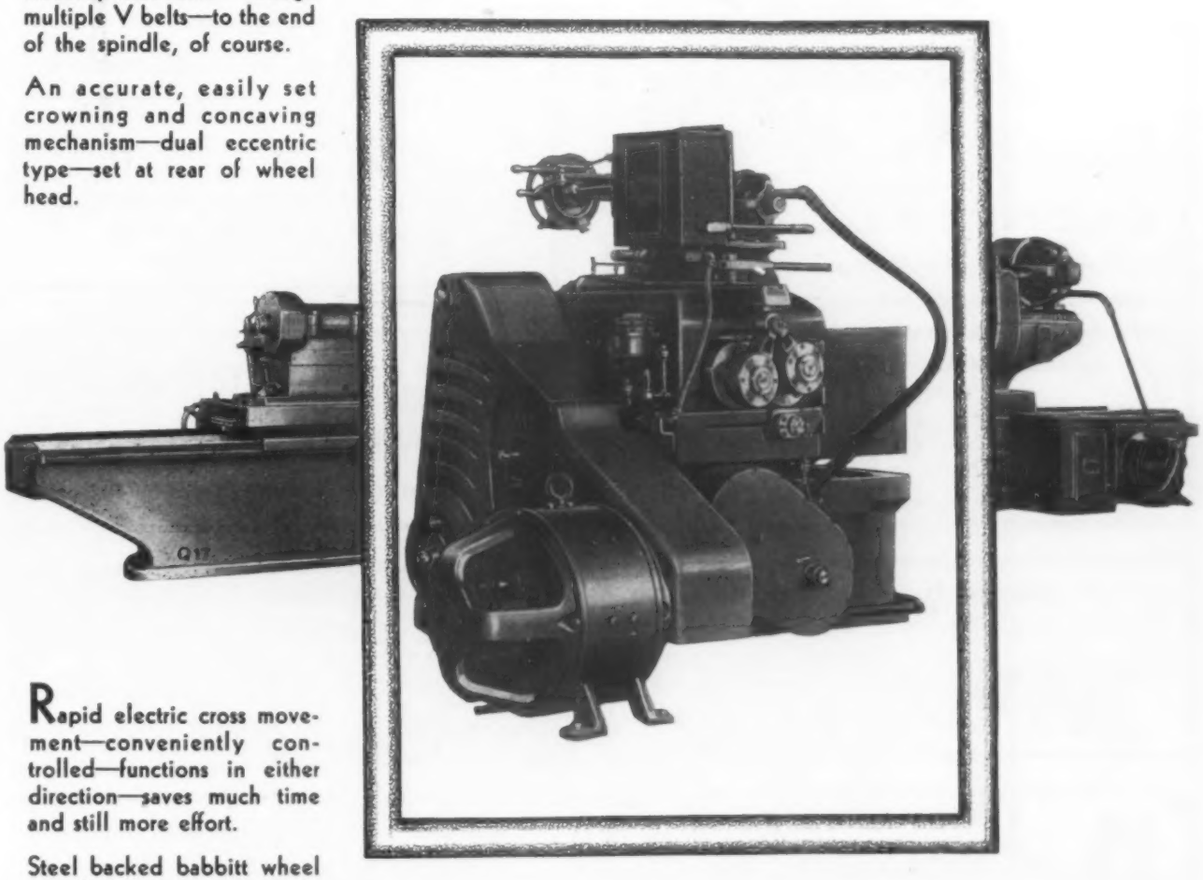
ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

Consider for a moment- the LANDIS Hydraulic Roll -grinder wheel head-

A quiet and accessible wheel spindle drive—through multiple V belts—to the end of the spindle, of course.

An accurate, easily set crowning and concaving mechanism—dual eccentric type—set at rear of wheel head.



Rapid electric cross movement—conveniently controlled—functions in either direction—saves much time and still more effort.

Steel backed babbitt wheel spindle bearings—adjustable for wear—continuously lubricated—trouble free service.

LANDIS TOOL COMPANY

WAYNESBORO. PA.

DETROIT CHICAGO NEWARK PHILADELPHIA

63

"NO. 242" DRILL

ALL-GEARED

EFFICIENT

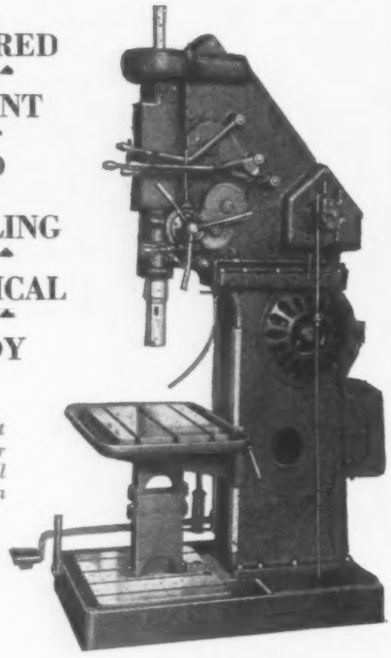
RIGID

SELF OILING

ECONOMICAL

SPEEDY

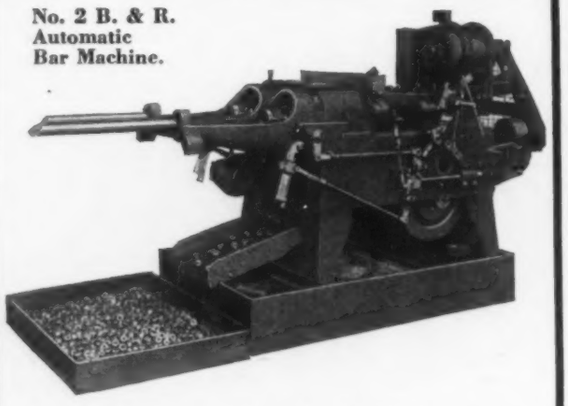
Furnished belt or motor driven. Get all the details in catalog "I."



BARNES DRILL CO.

815 - 831 Chestnut St., Rockford, Ill.

No. 2 B. & R. Automatic Bar Machine.



Profit-Earning Nut-Blank Equipment.

Proven Advantages of B. & R. Automatic Bar Machines for Making Nuts

More Nuts from given weight of stock used.

Higher Grade of Product.

More Production per spindle per hour.

Repeat orders verify these claims.

These machines are built in four sizes, covering range of nut sizes from ¼" to 2" U. S. Std. Will handle either cold-drawn or hot-rolled bar stock.

THE BUDD-RANNEY ENGINEERING CO.

119 WEST CHESTNUT ST., COLUMBUS, OHIO, U. S. A.

LELAND-GIFFORD COMPANY

Worcester, Mass.

Drilling Machinery

Belt and Motor Spindle

One to Six Spindles

Tapping Attachments and Multiple Heads

WM. SELLERS & CO.

INCORPORATED

1600 Hamilton Street Philadelphia, U. S. A.

Builders of Heavy Machine Tools for 80 Years

Kingsbury Automatic Sensitive High Speed Drill Heads

can be furnished in multi-spindle vertical, horizontal and turret type machines. Write for catalogue of these high production machines of ¾" capacity.

Kingsbury Machine Tool Corp.
Keene, New Hampshire

CINCINNATI LATHES

Judge engine lathes by past performance. Have us show you what the latest Cincinnati can do on your work. There is a size for every job—from 16" to 32": cone or geared head; belt or motor drive; with standard or special attachments; also tooling equipment if needed for your specific requirements. We tool up complete for production, manufacturing or tool room work. Specialists 25 years.

THE CINCINNATI LATHE & TOOL CO.
OAKLEY, CINCINNATI, OHIO, U.S.A.

A COMPLETE LINE of Fabricating Tools

Thomas Spacing Machine Co.

Chicago Pittsburgh Philadelphia

Lathes—Vertical Millers—Die Sinkers

Jigs Boring Machine—Special Machinery

REED-PRENTICE CORPORATION

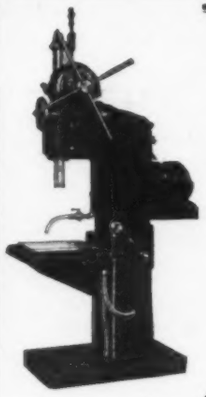
WORCESTER, MASS.

BRANCH OFFICES:
3-245 General Motors Bldg., Detroit, Mich.
Room 715, 41 Broad Street, New York City

LATHES
RADIALS
SHAPERS

The AMERICAN TOOL WORKS Co.

CINCINNATI U.S.A.



POWER—RIGIDITY
LOW MAINTENANCE

BARNES
PRODUCTION DRILLS

Established 1872

W. F. and John Barnes Co.
Rockford, Illinois

Cone 4-Spindle Automatics

Are economical and accurate producers of screw machine parts up to 4 3/8" to 7" milling length. They cut costs, increase production, boost profits

Write for Particulars

CONE AUTOMATIC MACHINE CO., Inc.
WINDSOR, VERMONT

REPRESENTATIVES:

Detroit: J. C. Austerberry's Sons, 684 E. Congress St., Detroit, Mich.
Chicago: John M. Glover, 2127 North Sayre Ave., Chicago, Ill.
Ohio: S. B. Martin, 3348 Superior Avenue, Cleveland, Ohio.
New England: Potter & Johnston Machine Co., Pawtucket, R. I.
Indiana: G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.
New York State: Syracuse Supply Co., Syracuse, N. Y., also Rochester, N. Y.
Pennsylvania: Arch Machinery Co., 1005 Park Bldg., Pittsburgh, Pa.
Philadelphia: Lloyd & Arms, Inc., 133 South 36th St., Philadelphia, Pa
California: C. F. Bulotti Machinery Co., 829-831 Folsom St., San Francisco, Calif.

CONFIDENCE

USERS have confidence in Monarch Helical-geared Timkenized Lathes because they are *guaranteed* to give complete satisfaction. Write for 44-page catalog No. 132.
THE MONARCH MACHINE TOOL CO.
Sidney, Ohio, U. S. A.

Monarch Lathes
Helical Gears - Timken Bearings
SMOOTHER..QUIETER..MORE POWERFUL

BAKER Vertical Boring and Drilling Machines Cylinder Borers Keyseaters

BAKER BROTHERS, Inc.
TOLEDO OHIO, U. S. A.

LATHES-TOOL ROOM GRINDERS
LE BLOND
THE
R.K. LE BLOND MACHINE TOOL CO.
CINCINNATI, OHIO

Bench Vise

Berjo

–the Vise with the Educated Jaws

Jigs and fixtures are seldom needed in shops using BERJO VISES.

Important savings are the direct result. The BERJO is the only vise on the market that will grip, positively, pieces having irregular shapes.

A turn of the end lever holds the work securely.

Valuable for bench work and for milling machines, drill presses, shapers, and other tools.

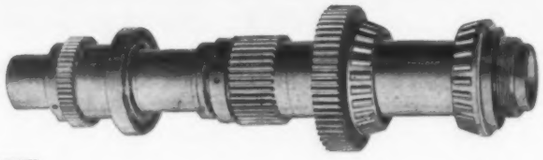
Write for details

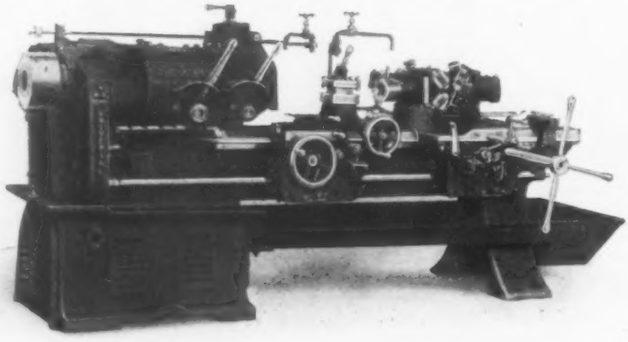
Manufactured under exclusive license by

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO

Machine Vise

The No. 1 and No. 2
Universal
HEAVY TYPE
TURRET LATHES with . . . . . .



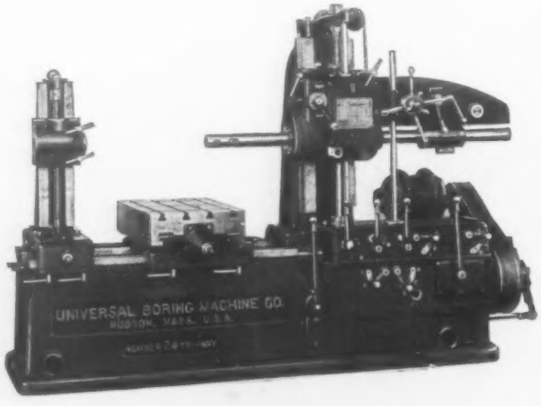


Roller Bearing
Superior Mounted
Spindle
and Many Other
Features

THE ACME MACHINE TOOL CO.
4955 SPRING GROVE AVE. CINCINNATI, O.

UNIVERSAL
(HORIZONTAL) BORING MACHINE
TRI-WAY TYPE

For Tool Room Work
and large production



UNIVERSAL BORING MACHINE CO.
HUDSON, MASS., U. S. A.

"Where Accuracy Counts, We Win" 3007

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
LUCAS POWER FORCING PRESS
THE LUCAS MACHINE TOOL CO.
Cleveland Ohio, U. S. A.

The Improved No. 3 Lapointe
Duplex Broaching Machine
Guaranteed to pay for itself in one year's time by increased production.
LAPOINTE MACHINE TOOL COMPANY
Hudson, Mass., U. S. A.

BROACHING TOOLS and
BROACHING MACHINES
OF ALL SIZES AND DESCRIPTIONS
Quality and Service
AMERICAN BROACH & MACHINE COMPANY
Ann Arbor, Michigan

MILWAUKEE MILLING MACHINES
MILWAUKEE-MIL PRODUCTION
MILLERS
KEARNEY & TRECKER
CORPORATION
3930-NATIONAL AVE MILWAUKEE, WIS

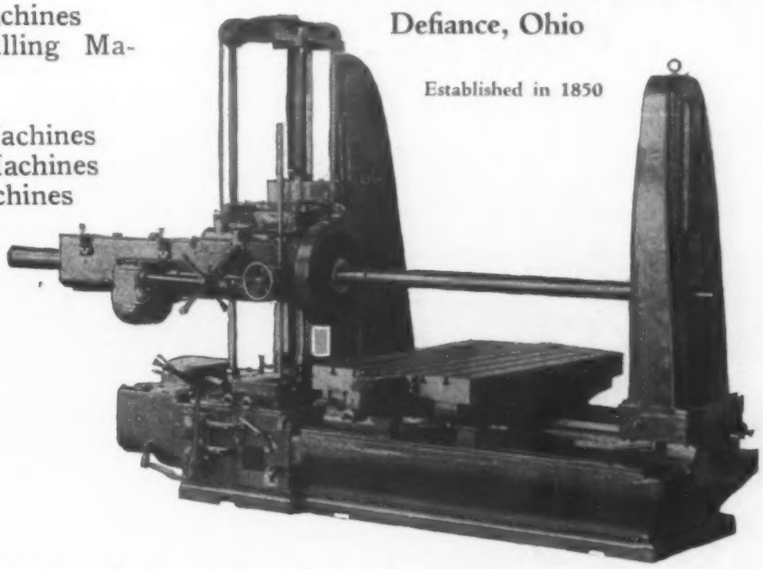
The Defiance No. 6 Horizontal Boring, Milling, Drilling and Tapping Machine is cutting production costs and turning out superior work wherever it is used. If you are interested in this type of service get in touch with our engineers — they have helped many manufacturers to attain greater profits.

The Defiance Machine Works

Defiance, Ohio

Established in 1850

Cylinder Boring Machines
Heavy Service Drilling Machines
Rail Drills
Multiple Drilling Machines
Multiple Tapping Machines
Valve Grinding Machines



No. 6
4½ in. Spindle
Smaller Sizes:
Nos. 5-A and 5

Independent Power Rapid Traverse, both directions, for Head and Platen, giving 84" per minute.

Designers and Builders of Precision-Production Machine Tools

SPLINE MILLING MACHINES
VERTICAL MILLING MACHINES
SENSITIVE DRILLING MACHINES
PRESSES (FOOT AND POWER)
WET TOOL GRINDERS
SPECIAL MACHINERY

Send for descriptive circulars of these high production machines

THE TAYLOR & FENN COMPANY
HARTFORD, CONN., U. S. A.

Milling Machines · Grinding Machines
Gear Cutting Machines · Screw Machines
Cutters and Hobs · Machinists' Tools
Gears Cut to Order

BROWN & SHARPE

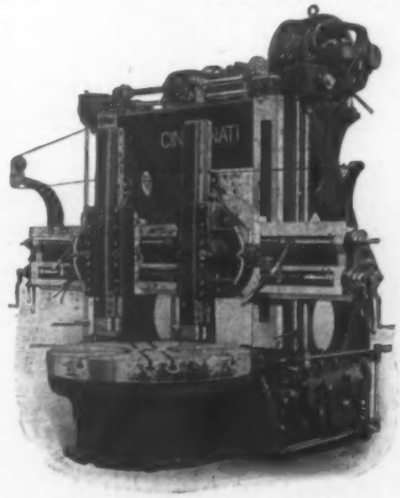
BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

Gray Planers

FOR MAXIMUM SERVICE
Double-Housing Openside and Switch Planers
The G. A. Gray Co., Cincinnati, Ohio

CINCINNATI RAPID PRODUCTION MILL

EASE OF OPERATION
CORRECT FEEDS AND SPEEDS
UNLIMITED POWER
STEEL GEARING
GRAVITY LUBRICATION
ARE A FEW OF THE RAPID PRODUCTION FEATURES



Built in Size 42 In. to 12 Ft.
THE CINCINNATI PLANER CO.
CINCINNATI, OHIO, U. S. A.

CLEVELAND OPEN-SIDE

THE CLEVELAND PLANER CO.
3146 SUPERIOR AVE.
CLEVELAND, O.

THE LIBERTY MACHINE TOOL CO.
HAMILTON, OHIO
MANUFACTURERS OF
STANDARD-OPENSIDE AND FROG AND SWITCH PLANERS

EXCELSIOR
Emery Grinders
"Sells" Roller Bearings
10", 14", 20" Drills
Punch and Shears
Commercial Bearings.
Foot Presses

Roller Bearing
Tumbling
Barrels

The ROYERSFORD
FOUNDRY & MACHINE CO.
Box I, Royersford, Pennsylvania

SHAPERS and GEAR CUTTING MACHINES
GOULD & EBERHARDT
ESTABLISHED 1833
NEWARK, N.J., U.S.A.

Blanchard Vertical Surface Grinders for production and accuracy.

BLANCHARD GRINDERS
The BLANCHARD MACHINE CO.
STATE ST., CAMBRIDGE, MASS.
BLANCHARD

SHAPERS simply designed but accurate and efficient
12-in. to 32-in. Stroke (Inclusive)
THE SMITH & MILLS COMPANY
Cincinnati, Ohio, U. S. A.

For True Economy in Flat Surface Finishing, Investigate
Gardner Disc Grinders
Gardner Machine Company
412 E. Gardner St., Beloit, Wis., U. S. A.

MOTOR DRIVEN DRY grinder for Alternating or Direct Current. Made in 3 sizes. Write for particulars.
The Springfield Mfg. Co.
321 Mountain Grove Ave.
Bridgeport, Conn.

The Cincinnati
ELECTRIC GRINDERS · BUFFERS
PORTABLE ELECTRIC TOOLS
Write for complete catalog
The CINCINNATI ELECTRICAL TOOL CO.
CINCINNATI, OHIO, U.S.A.

CENTERLESS BELT POLISHER FOR LIGHT PRODUCTION WORK
(Swings to Horiz. Position when Desired)
Combines—a Centerless Feed Grinding and Polishing Machine, an Internal Grinder or Polisher, and a Vertical or Horizontal Surfacer or Polisher. Ball Bearings. Ask for catalog.
PRODUCTION MACHINE CO.
Greenfield, Mass.

ABRASIVE SURFACE GRINDER
Either Horizontal or Vertical Spindle Type
Countershaft or Motor Drive
Get our bulletin for particulars
ABRASIVE MACHINE TOOL CO., East Providence, R. I.

Standard Ball Bearing Grinders and Buffers
Made in sizes from ¼ H.P. to 10 H.P. Drills, Center Grinders, Hand Grinders.
Write for Catalog and Price List.
The Standard Electrical Tool Co.
1948 W. Eighth St., Cincinnati, Ohio

STERLING ABRASIVES
AND STERLING GRINDING MACHINES
THE STERLING GRINDING WHEEL CO.
Abrasive Division of The Cleveland Quarries Co.
Factory and Office, Tiffin, Ohio
Branch at 23 S. Jefferson St., Chicago

HAMMOND
OF KALAMAZOO
GRINDERS AND POLISHERS
Electrically Driven - Belt Driven
In a Complete Range of Sizes and Types
Hammond Machinery Builders
KALAMAZOO, MICHIGAN
FORMERLY HILL-CURTIS COMPANY

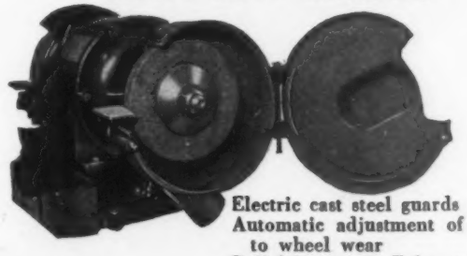
UNIVERSAL GRINDING MACHINES
Thompson 12" x 36" Universals
Combine in a single machine facilities for every possible grinding operation required in a machine shop. Write for Bulletin No. 18.
THE THOMPSON GRINDER CO.
1534 WEST MAIN ST., SPRINGFIELD, OHIO

BRIDGEPORT HYDRAULIC FACE GRINDERS

Rugged, powerful machines built for every class of production grinding work. Hydraulic table drives at any speed up to 85 ft. per minute—plenty of stamina to maintain this fast pace day after day. Equipment includes special Bridgeport Spindle which accommodates 26", 32" or 42" Bridgeport Sectional Wheels. Details on request.

The BRIDGEPORT SAFETY EMERY WHEEL CO., *Inc.*
1294 WEST BROAD STREET BRIDGEPORT, CONNECTICUT

SAFETY FEATURES OF BLACK & DECKER HEAVY DUTY GRINDERS

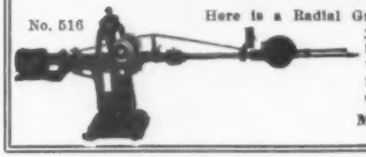


Electric cast steel guards
Automatic adjustment of guards to wheel wear
Ball bearings Exhaust ports
Weight—preventing vibration

THE BLACK & DECKER MFG. CO.
Towson, Maryland

RADIAL GRINDERS

No. 516



Here is a Radial Grinder to take the place of your old swing grinder. It is more powerful, more convenient, and has a wider range of work. Ask for a circular today.

MUMMERT-DIXON CO.
Hanover, Pa.

Curtis

Pipe Cutting and Threading Machines *give* Economy
Hand—Belt—Electric
Ranges ¼-2" to 8-16"

The Curtis & Curtis Co.
327 Garden St. Bridgeport, Conn.
Most Threads Per Dollar Invested

Maybe It's in the

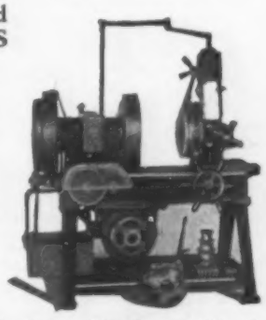
CLASSIFIED SECTION

If you can't find it in the regular advertising pages of The Iron Age—look in the Classified Sections at the back of this book. . . . . .

THE CLASSIFIED SECTIONS *of* THE IRON AGE

SAUNDERS NEW TYPE

PIPE THREADING and CUTTING MACHINES
No. 4B—Range ⅛" to 4"
No. 5D—Range 1" to 8"
Motor or Belt Driven.



Two Adjustable Expanding Dieheads to thread range of each machine. Reaming and cutting off attachments. Arranged for alternating or direct current. Machines for all conditions. ¼" to 18" inclusive.
Catalogue on request

D. SAUNDERS' SONS, Inc., Yonkers, N. Y.

THERE IS a KELLER BUR FOR EVERY KIND OF WORK!

KELLER BURS are made in over a hundred different shapes and cuts. Effective in removing feed lines, fins and burrs on castings, welding marks, etc.

KELLER BURS will work satisfactorily on steel, bronze, aluminum, copper, rubber, horn, wood, etc. They may be used in Flexible Shaft Machines, Portable Drills or Stationary Machines.

Write for our circular on KELLER BURS.

KELLER MECHANICAL ENGINEERING CORP.
70 Washington St., Brooklyn, N. Y.
Chicago Office
549 W. Washington Blvd.
Chicago, Ill.

ECONOMY ENGINEERING CO.

WILLOUGHBY-OHIO

HEADQUARTERS FOR BOLT & CAP SCREW MACHINERY
POINTING-THREADING & SHAVING MACHINES
Write for Catalog

The Hurlbut-Rogers Cutting-off Machine

Will Double Your Output

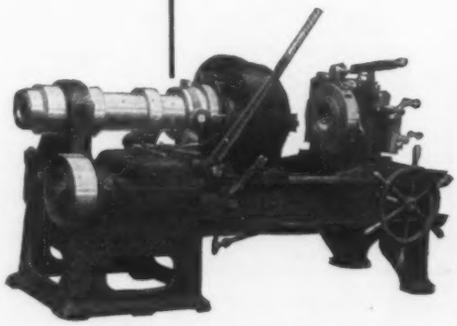
Equipped with two tools, cuts twice as fast.
Made in six sizes—two types of drive.
Send for descriptive catalog.

The Hurlbut Rogers Machinery Co.
NASHUA, NEW HAMPSHIRE

When the Gas Buggy Was a Novelty - - -

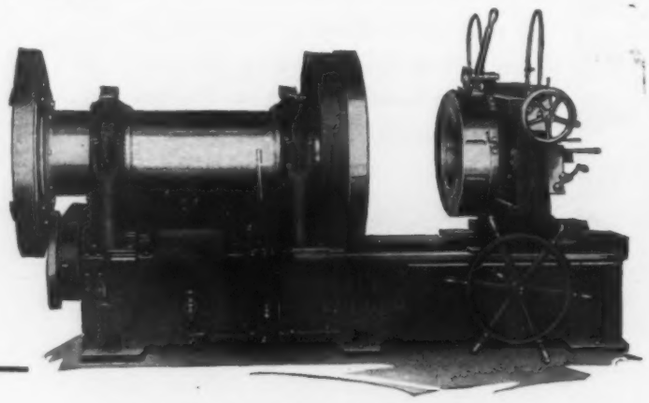
Way back, thirty or thirty-five years, when people watched the antics of the "new invention" with open mouths, many B & K Threading Machines first went into action. A good percentage of these machines are still in action, turning out accurate, clean-cut threads at a profit.

What better assurance than this have you that the B & K Machine you buy now will still be serving your business when the next generation takes the reins? Investigate B & K Threading Machines. They are a sound investment for any shop whose work includes pipe threading.



No. 4 P. D. Q. C. with Gear Box Drive. Capacity, 1" to 4" pipe. No. speeds, 8. Floor space, 34" x 92". Power requirement, 3 hp.

PEERLESS B&K DUPLEX P·D·Q·C



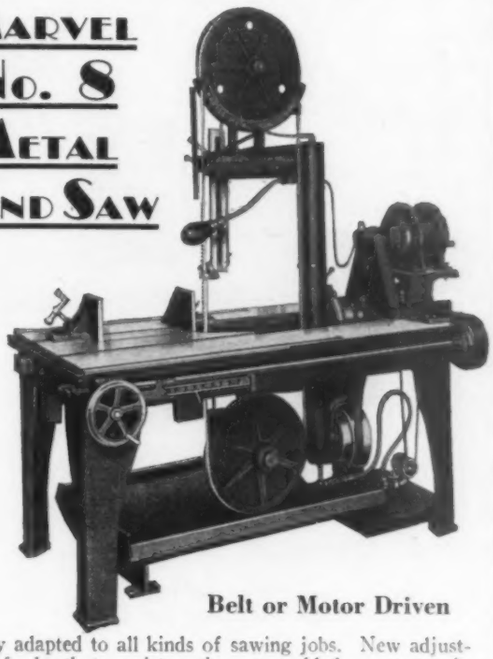
No. 10 and No. 12 Duplex Single Pulley Drive

	No. 10	No. 12
Capacity, pipe	3½" to 10"	4" to 14"
No. speeds	8	8
Floor space	76" x 125"	76" x 125"
Power required	7½-H.P.	7½-H.P.

BIGNALL & KEELER MACHINE WORKS
of the N. O. NELSON MFG. CO.

Edwardsville **Illinois**

MARVEL No. 8 METAL BAND SAW



Belt or Motor Driven

Easily adapted to all kinds of sawing jobs. New adjustable feeds that register the exact blade pressure in pounds. Three speeds. Capacity up to and including 18".

Cuts any angle up to 45 degrees.

A standard tool in hundreds of the best shops.

Write us today

Armstrong-Blum Mfg. Co. 349 N. Francisco Ave., Chicago, Ill.

Peerless Metal Sawing Machinery

Twenty years of specializing in the manufacture of fine metal sawing machinery has resulted in the present Peerless Line.

PEERLESS STANDARD TYPE HIGH SPEED METAL SAWING MACHINE: Size 6" x 6", Single Speed, Motor Driven. Similar machines in 9" x 9" or 13" x 16" capacity also is available.

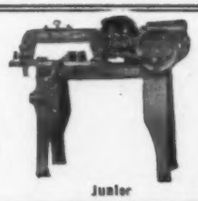
Also manufacturers of Peerless Universal Type High Speed Production Sawing Machines and Peerless Vertical Type Heavy Duty Saw for bars, billets, and Die Blocks.

Peerless Machine Co.
1218-16th St., Racine, Wis.
New York Office, 15 Warren St.

Twist Drills—Hobs Milling and Gear Cutters Reamers—Carbon or High Speed Steel

Specialists in laying out and designing Cutters for production work.

UNION TWIST DRILL CO.
ATHOL, MASS.



Junior

METAL CUTTING

There are Racine Machines for every metal cutting job.
The Shear Cut for Production Work.
The High Speed Saw for Regular Cutting.
The Band Saw for Wood and Metal.
The Abrasive Cutter for Hardened Steels.

Accuracy, speed and long life are inbuilt characteristics of this equipment. Write

RACINE TOOL & MACHINE CO.
1755 State Street, Racine, Wis.

Twist Drills Reamers — *See our advertisement in the June 26th issue.* — Screw Extractors

The CLEVELAND TWIST DRILL COMPANY CLEVELAND

Cutting Off Machines for Sawing All Kinds of Metals

THE ESPEN-LUCAS MACHINE WORKS
FRONT AND GIRARD AVE. PHILADELPHIA, PENNA.

BARBER-COLMAN
CUTTERS··HOBS··HOBBING MACHINES
HOB SHARPENING MACHINES···
REAMERS··REAMER SHARPENERS
BARBER-COLMAN COMPANY GENERAL OFFICES AND PLANT ROCKFORD, ILLINOIS, U.S.A.

Cutting-Off Machines
—for thin and thick wall steel tubing and bars
BARDONS & OLIVER
Cleveland, Ohio
We also manufacture a large line of turret machinery for finishing cast iron, steel and brass.

COCHRANE-BLY CO.
ROCHESTER, N. Y.
METAL SAWING MACHINES
SAW SHARPENING MACHINES
DIE SHAPERS & FILING MACHINES

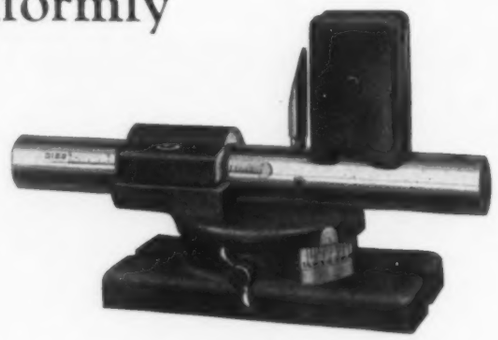
TOMKINS-JOHNSON

T-J TRADE-MARK

We Plan, Design and Make—
Pneumatic Air Cylinders
(Non-rotating, Double-acting Tubular Type)
Series B and C Air Cylinders
Hydraulic and Pneumatic Chucks
(Two and Three-Jaw)
Die Sinking Milling Cutters
(Standard and Special Designs)
Special Equipment
Representatives in all Principal Cities
Catalogs, Engineering Data and Prices On Request
The TOMKINS-JOHNSON CO., Jackson, Mich., U. S. A.

An Economical Way to Grind Chasers—Uniformly

The new Geometric Universal Chaser Grinding Fixture is a simple inexpensive appliance which can be used on practically any surface grinder. It is designed to sharpen all types and sizes of chasers on both the cutting face and chamfer.



No special skill is required to obtain absolute uniformity of grind. It is a simple matter to set up the fixture by means of visible scales for the particular type of chaser to be ground.

Chasers correctly resharpened will long outlast similar chasers reground free hand or with a makeshift fixture. Thus the savings on chaser purchases will soon pay for the fixture. Write for complete details.

THE GEOMETRIC TOOL COMPANY
New Haven, Conn.

Also Manufacturers of Self Opening Dies, Collapsing Taps, Solid Adjustable Taps and Threading Machines

SPECIAL TAPS

Solid or with Inserted Chases

May We Supply You?

THE PIPE MACHINERY COMPANY
930 E. 70th St. CLEVELAND, OHIO

MURCHEY Self-Opening Non-Rotating **Die Head**

Especially adapted to precision work. Chasers easily removed without taking off cap. Write for details.

MURCHEY MACHINE & TOOL CO.
951 PORTER ST., DETROIT, MICH.

Pointers on Buffs for the Purchasing Agent
Copy mailed on request

Divine Brothers Company
Utica, N. Y., U. S. A.
Abrasive Metal Finishing Engineers

FOR CUTTING METAL USE DISSTON SAWS

A style and size for every need. Sectional Interlocked and Solid

Circular Saws and High Speed Steel Hack Saw Blades.

HENRY DISSTON & SONS, Inc., Philadelphia, U. S. A.

Emery Wheel Dressers

Two Sizes **CUTTERS** Nos. 1-2

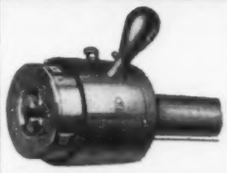
We make the regular Huntington (Pattern) for all sizes. Roughing for Nos. 1 and 2. Paragon for No. 1 only.

GEO. H. CALDER, Lancaster, Pa., U. S. A.

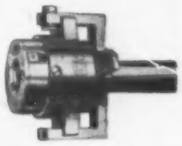
METAL SAWS—INSERTED TOOTH SAWS—RIVET SETS—CHISEL BLANKS—HIGH SPEED CUT-OFF MACHINES

For standard or special requirements. Specify HUNTER and insure lower production costs. Ask us for proof.

HUNTER SAW AND MACHINE CO.
5660 BUTLER STREET, PITTSBURGH, PENNA.



H & G DIE HEAD

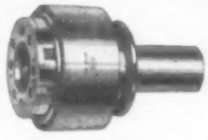


Style C
Hand closing Die Head for hand turret machines

Send for the Threaded Part Data Book

Style D
Head for Brown & Sharpe Automatics and other small machines

Threading Machine
Designed to produce quality threads at high speed and low cost



Chaser Grinder
Designed to regrind H & G Chasers on chamfer and cutting faces, thus insuring better threads

Style EE
(Rotary)
Designed for automatics, threading machines and bolt cutters; where the die head rotates

Quality Threads Dependable Performance

H & G Die Heads are famous for: 1, Quality of threads produced; 2, High production possibilities; 3, All around dependability.

The reason is simplicity of construction—the manner in which chasers are solidly supported and positively opened.

All Styles of H & G Die Heads use the same chasers thus simplifying chaser stock. There is a size and style of H & G Die Head for all types of machines on which threads are cut.

Standardize on H & G for thread cutting.

If you have not received your copy of the "Threaded Part Data Book," send for it today. You will find in it an indispensable source of information in connection with the design and manufacture of threaded parts. Fill in the coupon now in order to be certain to get your copy of this "Book of The Year."

The EASTERN MACHINE SCREW CORPORATION

Truman & Barclay Streets,
New Haven, Conn.

Gentlemen: Please send me my copy of your Threaded Part Data Book.

Name .....

Firm .....

Address .....

City .....

The new SAFETY "Perfec-Hole" wheels slip on to the adapters snugly, but without forcing. They are *guaranteed* accurate to a slip fit.

They said it couldn't be done

. . . but these new "Perfec-Hole" wheels by SAFETY are as accurately machined as the adapters themselves

Again SAFETY has done "the thing that couldn't be done." This time it is the development of a new process, upon which patents are pending, and by means of which large-hole grinding wheels are fitted with lead centers *guaranteed* accurate to a slip fit. This lead center is firmly imbedded in the abrasive, yet is not over 1/32" thick at any point.

Thus is removed, once and for all, the old nuisance and expense of trying to mount wheels that did not fit the adapters . . . that were either so snug that they set up an initial strain in the wheel and sometimes caused breakage in forcing them on, or else were so loose that they had to be shimmed, which made the wheel unbalanced.

We believe this is one of the most important grinding-wheel developments in recent years. Users agree . . . and are enthusiastic in their comments. You will be, too, when you find out what a difference these wheels make. The cost is the same as standard list. The advantage is just another item of *extra* value by SAFETY.

Investigate *today,* for your own satisfaction . . . and your own profit.

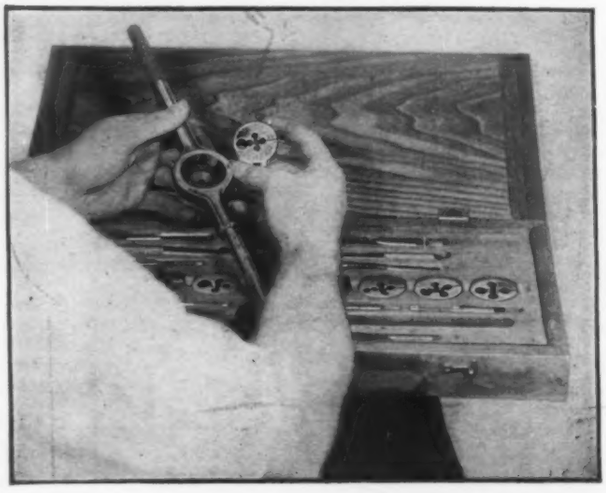
THE SAFETY GRINDING WHEEL & MACHINE COMPANY
2373 Columbus Avenue, Springfield, Ohio

"A wheel for every need" . . . *backed by 37 years' experience*

0-18

A Desirable Combination

In this new Brubaker Screw Plate you get a combination of U.S.S. and S.A.E. Threads. This broadens its range and makes it a most useful set of tools in shops where the combination of threads is used.

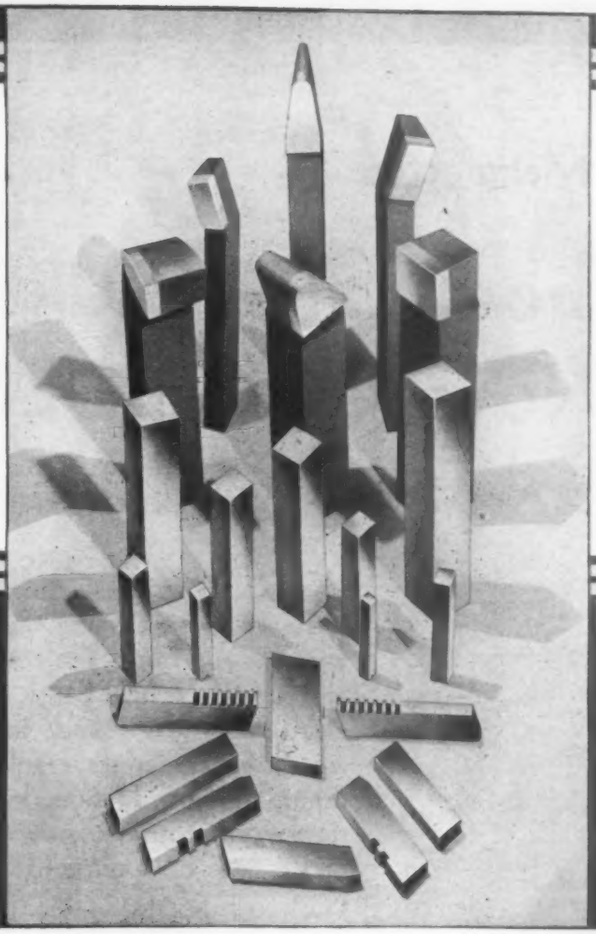


BRUBAKER Screw Plate

The Taps and Dies in Brubaker Screw Plates possess all the factors that have made Brubaker Tools the choice of particular craftsmen.

Collets in these sets insure accuracy. Dies are all adjustable, and Taps are furnished in plug style.

W. L. BRUBAKER & BROS. Co.
FACTORY, MILLERSBURG, PA.
Sales Offices: 50 Church St., New York



When You Use

Haynes Stellite

Standard Tools

YOU buy for less

•

YOU get immediate deliveries

•

YOU lower your tool inventory

•

YOU reduce your manufacturing cost

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

DISTRICT SALES OFFICES

Chicago—Carbide and Carbon Bldg. Cleveland—628 Keith Bldg.
Detroit—4-240 General Motors Bldg. Houston—6119 Harrisburg Blvd.
Los Angeles—1310 Santee Street New York - 30 East 42nd Street
San Francisco—114 Sansome St. Tulsa—Exchange National Bank Bldg.

General Offices — Kokomo, Indiana

Ask the nearest district office for a list of Haynes Stellite Standard Tools

HAYNES STELLITE

Steps Ahead in
Grinding Wheel Manufacture

Wheel STRUCTURE Now CONTROLLED

As Well as Grain and Grade

Modern high production grinding requires more than the correct abrasive and bond, the correct grain and grade. Wheel STRUCTURE, also, must be right — and in Norton wheels for centerless, crankshaft and other high production, high precision work, you may now specify it just as you do grain and grade.

NORTON CONTROLLED STRUCTURE makes possible:

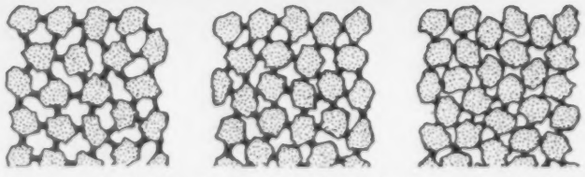
1. Closer fitting of wheels to their job.
2. Closer duplication of wheels.
3. A simplified system of wheel marking.

A booklet completely describing the new marking system will be sent upon request.

▼ ▼ ▼

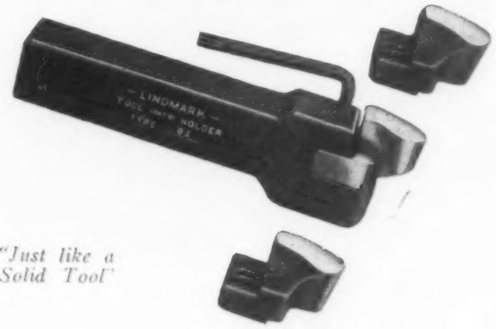
NORTON COMPANY, Worcester, Mass.

NORTON GRINDING WHEELS



A diagrammatic sketch showing how three wheels may be identical in grain size and in grade (bond strength) but differ in grain spacing or STRUCTURE—and thereby differ in grinding action.

LINDMARK
the
PRODUCTION HOLDER



"Just like a Solid Tool"

Suitable for Boring Mills, Planers and Heavy Duty Lathes

The holder supports the bit as near the cutting edge as possible, taking practically all of the strain.

"Stellite" bits are cast for exclusive use with LINDMARK Tool Holders—the Tool Bits are interchangeable.

THE APEX TOOL COMPANY, INC.
50 Remer St., Bridgeport, Conn.

"VANADIUM"
Air Hammer Rivet Sets

Never chip or upset in the hammer barrel. They are made of the highest grade Vanadium steel, hardened and tempered by our own process, and are the most economical rivet sets to use in the long run.

Our "VANADIUM" Rivet sets last longer than the ordinary kind and warrant your investigation.

Shipped on Approval
Prices on Application

GEO. F. MARCHANT COMPANY

1422 So. Rockwell St., Chicago

TRY PAPER SOLDERING HANDLES

They cannot split, will not get hot or burn and always remain tight on the rod.

The KAALOT MFG. CO., 3927 N. Kedzie Ave., Chicago, Ill.
Manufacturers of Paper File Handles and Fibre Mallets

QUALITY COLLETS AT MASS PRODUCTION PRICES

SIZES FITTING LEADING MAKES of BENCH LATHES AND ENGINE LATHES

RIVETT LATHE & GRINDER CORP.

Send for special collet booklet

BRIGHTON DISTRICT BOSTON, MASS.

"LOGAN"

New Foot Control Units for Air Operated Devices

Among the items in the NEW CATALOG S-25:

Air Valves, Chucks, Cylinders (rotating and non-rotating), Arbor Presses, Ejecting and Reducing Valves. Special Devices. *Write*

THE LOGANSPORT MACHINE CO. **Logansport, Indiana**

23,658 HOLES PER PUNCH

ALL KINDS, SIZES AND STANDARDS
SEND FOR FREE SAMPLE
I. P. RICHARDS CO.
23 Pemberton St., Providence, R. I.
Punches and Dies Since 1868

WHITON LATHE CHUCKS

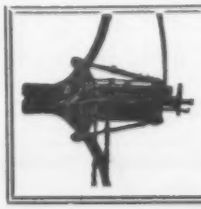
Complete lines of Independent, Universal and Combination Chucks
Lathe and Drill Chucks

THE D. E. WHITON MACHINE CO.
New London 206 Howard St. **Connecticut**

DICKINSON "Diamond"

Tools for truing **Large, Coarse and Hard Emery Corundum, Carborundum, Alundum, Crystolon** or other abrasive wheels give the **greatest amount of service** with a **minimum of wear** on the **diamond.** Diamonds can be set in any style of holder desired. We have had a great many years' experience in the manufacture of Diamond tools and are thoroughly familiar with what is required of them.

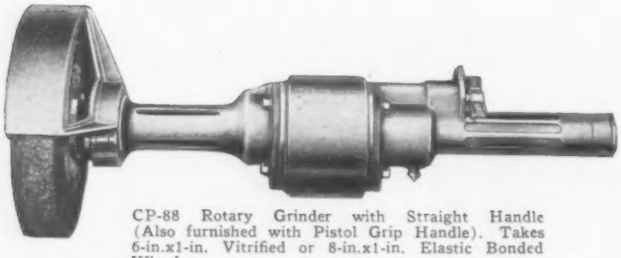
THOS. L. DICKINSON, 34 Gold Street, New York
Established 1796. Successor to John Dickinson



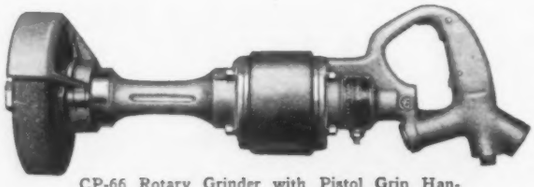
"HELWIG" Pneumatic Portable Bolt Clipper

Five sizes—capacities 1⅝" to zero. Cuts off bolts straight and smooth, close to work and any length—averaging 1000 an hour. No skilled help required. Also other important Time and Labor Savers—Pneumatic and Hand-operated: Drills, Hammers, Wire and Bolt Clippers; Shears, Punches, Riveteless Metal Seamers; Pipe Expanders, Etc.; Powerful, Handy, Simple Design. Compactly Built.

HELWIG MFG. CO.
St. Paul, Minnesota, U. S. A.



CP-88 Rotary Grinder with Straight Handle (Also furnished with Pistol Grip Handle). Takes 6-in.x1-in. Vitrified or 8-in.x1-in. Elastic Bonded Wheel.



CP-66 Rotary Grinder with Pistol Grip Handle (Also furnished with Straight Handle). Takes 4-in.x1-in. Vitrified or 6-in.x1-in. Elastic Bonded Wheel.

CP ROTARY GRINDERS

THESE smooth-running, non-vibrating grinders develop more power per unit of air consumed than any similar tools. Their construction is very simple resulting in an appreciable weight reduction and unusually low maintenance. Write for a copy of SP-1747 giving details.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: Chicago Pneumatic Bldg.

6 East 44th Street New York

Sales and Service Branches all over the World.

P-315

CLECO FOUNDRY SAND RAMMERS

For Floor, Flask, Bench and Core Ramming

"LIGHT AND FAST NO VIBRATION OR RECOIL IN OPERATION"

No. 4 RAMMER IN OPERATION

MADE IN 3 SIZES NOS. 1, 4 AND 5.

OIL RESERVOIR IN HEAD FOR AUTOMATIC LUBRICATION

CLECO RAMMERS LIFT AND CARRY THEIR OWN WEIGHT WHEN RUNNING.

REGULARLY FITTED WITH ROUND ROD AND 3-IN BUTT.

FLAT ROD AND PIEN FURNISHED ON ORDER.

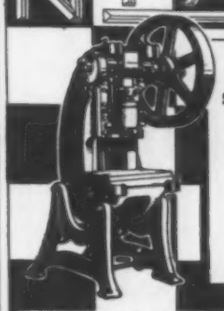
SHIPPED FOR TRIAL TO INTERESTED USERS. NO OBLIGATION.

No. 4 No. 1

WRITE FOR LATEST CATALOG NO. 30
BRANCH OFFICES IN ALL THE PRINCIPAL CITIES

THE CLEVELAND PNEUMATIC TOOL CO.
CLEVELAND, OHIO, U. S. A.

NIAGARA



Exclusively Since 1879

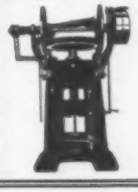
SHEET METAL WORKING MACHINES, TOOLS AND DIES

POWER PRESSES
PUNCHES
SQUARING SHEARS
AND ROTARY SHEARS

Also complete line of sheet metal shop machines and Tools

Write—

NIAGARA MACHINE & TOOL WORKS · BUFFALO, N. Y., U. S. A.



Patent Percussion Power Presses

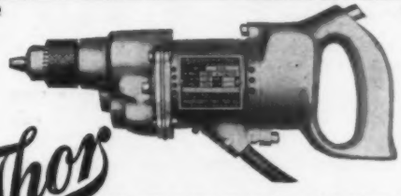
The Presses for hot pressed brass parts. Excellent for cold pressing, coining, etc. Also all other types of Power Presses. Up-to-the-minute construction. Fully safe-guarded. Automatic feeds.

Zeh & Hahnemann Co., Newark, N. J.

MINSTER POWER PRESSES

Inclinable, Horning, Straight Side, Punching, Gap, Knuckle Joint and Screw Presses

THE MINSTER MACHINE CO.
Minster, Ohio, U. S. A.



Thor **ELECTRIC DRILLS**

Built throughout of rugged, easy-running parts. Have the famous *Thor* Superpower motors. Designed to withstand hard, continuous service day after day, month after month, for years. Made in all sizes and types for every need, for alternating, direct, and high frequency alternating currents. Write for catalog.

Independent Pneumatic Tool Co.
616 W. Jackson Blvd., Chicago

PRESSES
FOR
SHEET METAL STAMPINGS
FERRACUTE MACHINE CO., Bridgeton, N. J.

Cincinnati Press Brakes *All-Steel*

See our full page every other issue or write direct to— THE CINCINNATI SHAPER CO. CINCINNATI, OHIO

Cincinnati Shapers *Rapid Traverse*

Automatic *Punch Press Feeds*

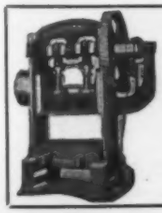
F. J. LITTELL (SPEED With SAFETY) **MACHINE CO.**

4125 Ravenswood Av. CHICAGO

CLEVELAND
POWER (FOR PROFITABLE PRODUCTION) **PRESSES**

THERE'S A CLEVELAND FOR EVERY POWER PRESS REQUIREMENT

Cleveland Punch & Shear Works Co., Cleveland, Ohio



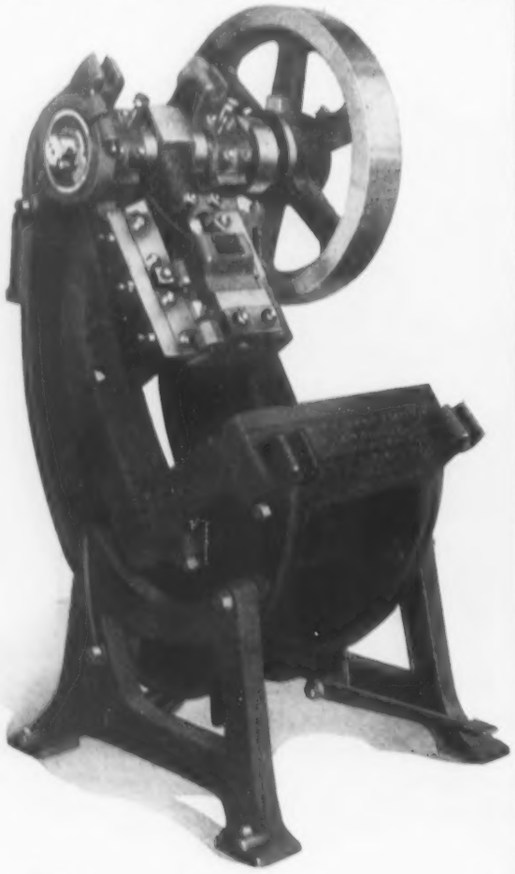
Robinson Sheet Metal Working Machinery

Inclinable Presses — Gap Presses
Double Crank Presses — Squaring Shears
Horning Presses — Gap Shears
Toggle Presses — Corrugating Machines
Hand and Power Brakes

NEW ALBANY MACHINE MFG. CO.
Sole Owners J. M. Robinson Mfg. Co.
NEW ALBANY, IND.

V & O POWER PRESSES
AUTOMATIC FEEDS
AUTOMATIC THREADING MACHINES
THE V & O PRESS CO., HUDSON, N. Y.

THE
"Toledo"
inclinable
OPEN BACK PRESSES



THE accuracy and efficiency of "TOLEDO" Presses are due to correct applications of modern engineering principles. The inclinable presses are built in 30 sizes and easily adapted to nearly every kind of blank cutting, forming, perforating, drawing, shaping and combination die work.

PRESSES FOR EVERY PURPOSE
Over two thousand patterns from which to choose.

THE TOLEDO
MACHINE & TOOL CO.
Engineers, Founders and Machinists on Equipment for Sheet Metal Products
TOLEDO, OHIO, U. S. A.

CHICAGO OFFICE
323 W. Washington Blvd.

DETROIT OFFICE
3-238 General Motors Bldg.

HYDRAULIC MACHINERY SINCE 1851
ELMES
CHICAGO

...ACCUMULATORS.....
...PRESSURE PUMPS.....
...VALVES & FITTINGS.....
...FORCING PRESSES.....
...FORGING PRESSES.....
...FORMING PRESSES.....
...EXTRUDING PRESSES.....
...STRAIGHTENING PRESSES.

HELE-SHAW HYDRAULIC DRIVE UNITS

CHARLES F. ELMES ENGINEERING WORKS
1003-1011 Fulton St., Chicago, U. S. A.

SOUTHWARK
POWER TOOLS
TESTING EQUIPMENT
HYDRAULIC AND SPECIAL MACHINERY
SOUTHWARK FOUNDRY AND MACHINE CO.
PHILADELPHIA

JOHN ROBERTSON CO
HYDRAULIC PRESSES and PUMPS
Extrusion Presses — Platen Presses — Hydraulic Pressure Pumps
Lead Encasing Presses — Moulding Presses — and Special Machinery
See our advertisement in the second issue, each month.
123 WATER ST BROOKLYN, N.Y.

LAKE ERIE
ENGINEERING CORPORATION
270 PERRY STREET BUFFALO, N.Y.
DESIGNERS AND BUILDERS OF
Hydraulic Presses and Accumulators
Plate Working Machinery
Bending Rolls
Plate Planers
Punches and Shears.
Steel Steam Plates
Fittings
Scale Test Cars.
Special Machinery
Machinery

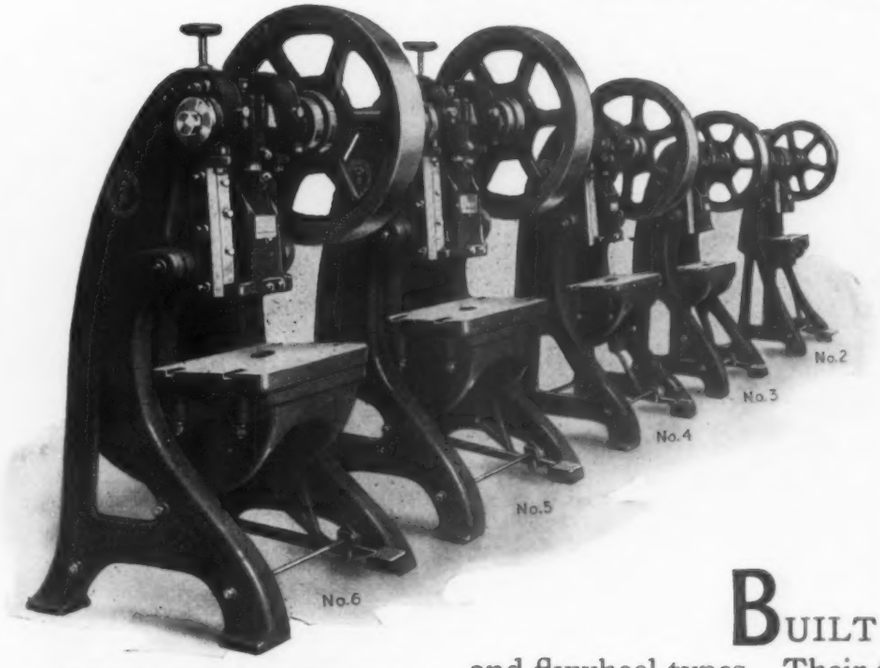
FRENCH
HYDRAULIC
MACHINERY
PIQUA OHIO

SHEARS-PUNCHES
HEAVY PRESSES
UNBREAKABLE
STEEL PLATE
FRAMES
PELS
HENRY PELS
& CO., Inc.
90 West St., New York

MILWAUKEE
ALLIGATOR SHEARS
Milwaukee ALL STEEL Shears will outcut and outlast any other alligator shear. They are made by BUILDERS OF ALLIGATOR SHEARS ONLY—FOR 30 YEARS.
DOELGER & KIRSTEN
3106 Chambers Street, Milwaukee, Wis.

"ADRIANCE"

INCLINABLE OPEN BACK POWER PRESSES WITH FRONT ADJUSTMENT



Pacific Coast Representatives:
C. F. BULOTTI MACHINERY CO.
829 Folsom St., San Francisco, Cal.

WESTERN MACHINERY EXCHANGE
Santa Fe Ave. at 9th St.
Los Angeles, Cal.

BUCK & HICKMAN, LTD.
2 Whitechapel Road, London
Sole Agents for Great Britain

We manufacture:

Inclinable Presses
Straight Side Presses
Square Double Seamers
Round Double Seamers
Automatic Feed Presses
Horning and Wiring Presses
Double Action Presses
Double Crank Presses
Drawing Presses
Automatic Screw Rolling Machines
Punching Presses
Arch Type Presses
Slitters and Shears
Can Making Machinery
Spinning Lathes
Power Squeezers
Crown Cap Making Equipment
Dies and Tools
for Working Sheet Metal

BUILT in five sizes in geared and flywheel types. Their flexibility of operation with dies upon sheet-metal has commended them to the trade as the most practical of all-purpose power presses. "Adriance" Automatic Feeds may be attached to these presses, making complete automatic units for the increased efficiency required in modern mass production.

ADRIANCE MACHINE WORKS, INCORPORATED

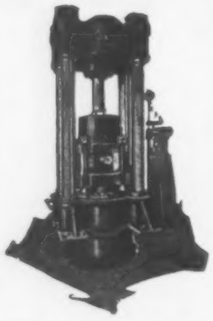
82 RICHARDS STREET BROOKLYN, N. Y.

☐ Please send copy of Bulletin No. 1, illustrating and describing "Adriance" Inclinable Open Back Power Presses.

☐ Please send information regarding.....

Name .....

Address .....



2100 Ton Lead Press
for covering cable and vulcanizing rubber hose.

THERE IS A

WATSON-STILLMAN

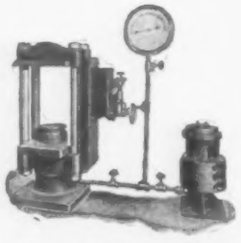
Hydraulic Press

For Every Requirement

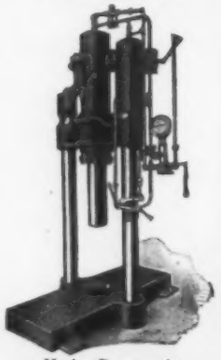
Our engineering experience of over 80 years is at your service. We build complete hydraulic plants, including pipe, valves, pumps, accumulators, intensifiers, and presses for every purpose such as

Forging	Bending
Forcing	Clay Forming
Forming	Sagger Molding
Dehydrating	Molding and Vulcanizing
Thermo Plastic Molding	Oil Extracting
Blocking and Extruding	Cocoa Butter Extracting
Briquetting	Compressing and Forming,
Baling	Etc.

Molding Press for Plastic Materials



Laboratory Press for Testing Concrete Cubes, etc. An Accumulator is furnished to calibrate the gauge.



Hydro-Pneumatic Forcing & Bushing Press

Write for Catalogs

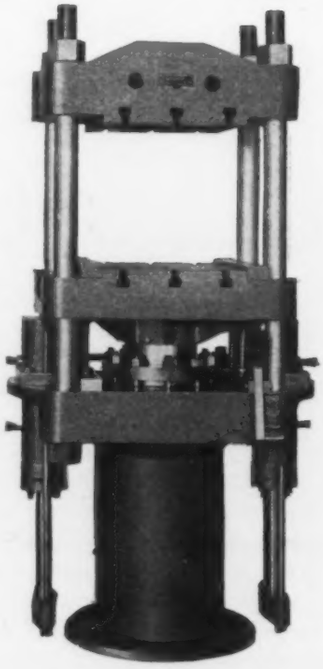
THE WATSON-STILLMAN CO.

71 West Street, New York

Penton Bldg., Cleveland
205 Olive St., St. Louis
Union Trust Bldg., Pittsburgh
321 Brown Marx Bldg., Birmingham
First Nat'l Bank Bldg., Cincinnati
228 Central Ave., Los Angeles
58 Freemont St., San Francisco
1635 17th St., Denver
224 Pine St., Portland, Ore.
518 4th Ave., Seattle
228 N. La Salle St., Chicago
6565 Russell St., Detroit
Union Nat'l Bank Bldg., Houston
Widener Bldg., Philadelphia
Forsyth Bldg., Atlanta
1039 Mutual Bldg., Richmond

ROCK RIVER ENGINEERING PRESSES

Hand and semi-automatic types for plastic molding. We are prepared to furnish complete installation in all styles and capacities.



by the designers and builders of ***ROCK RIVER ENGINEERING***

PLATE BENDING ROLLS
AUTOMATIC SPACING TABLES
HYDRAULIC EQUIPMENT
PUNCHES SHEARS

ROCK RIVER ENGINEERING CO.
304 NORTH MAIN ST. JANESVILLE, WIS.

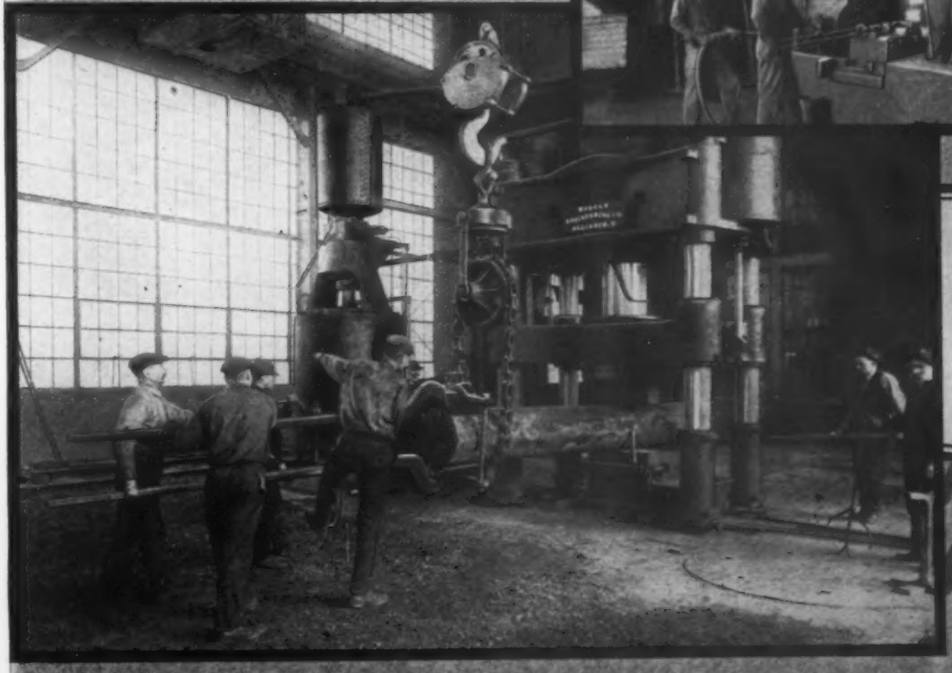
MORGAN

Forging Presses and Drop Hammers

12,000 Pound Drop Hammer built for The General Motors Corporation.

Forging Hammers
150 to 40,000 pounds capacity.

Drop Hammers
1,000 to 16,000 pounds capacity.



800 Ton Steam Hydraulic Forging Press

Single Frame Types
150 to 500 tons capacity.

Four Column Types
Up to 6,000 tons capacity.

THE
MORGAN ENGINEERING
COMPANY

NEW YORK
25 BROADWAY

ALLIANCE, OHIO, U.S.A.

PITTSBURGH
1420 OLIVER BLDG.

Designers - Manufacturers - Contractors

Steel Plant Equipment - Forge Shop Equipment - Special Machinery Of All Kinds

Achievements develop thru test

. . . and thru achievements we raise ourselves from the sluggishness of yesterday.

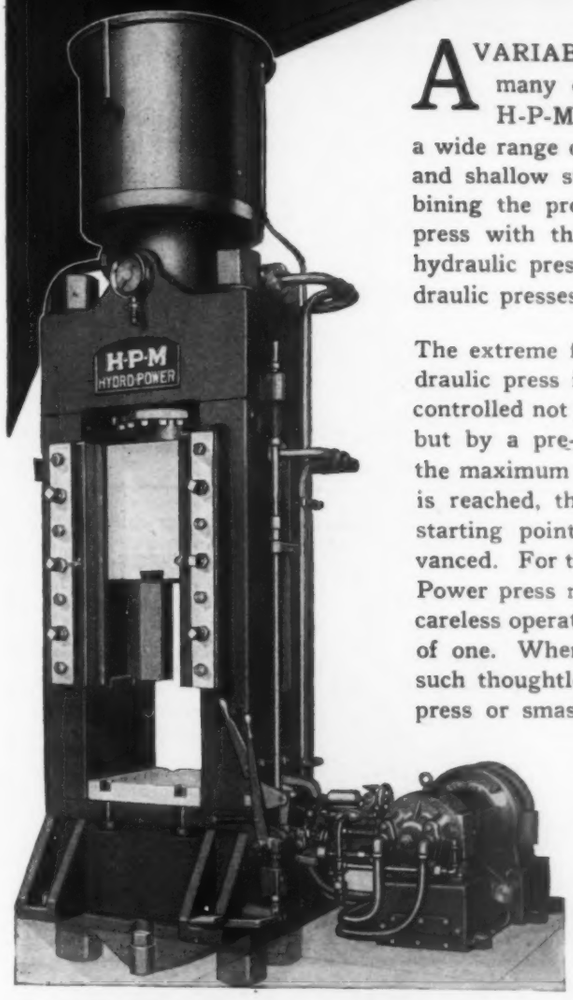
To promote the certainty of the test, Birdsboro designs and builds to your requirements — hydraulic testing machinery for the proving of pipe and shell; to record tension, compression and flexure; for springs and for general laboratory purposes.

Your achievements will profit with Birdsboro serving in the capacity for a *better* test.

BIRDSBORO

STEEL FOUNDRY AND MACHINE COMPANY
DESIGNERS AND BUILDERS
BIRDSBORO, PENNSYLVANIA

The H-P-M Hydro-Power Press Handles *Deep-Drawn Work* or *Shallow Stamping* Equally Well



A VARIABLE working stroke is one of the many outstanding advantages of the new H-P-M Hydro-Power Press. Adaptable to a wide range of work, it handles deep drawn parts and shallow stampings with equal facility. Combining the productive capacity of the mechanical press with the smoothness and flexibility of the hydraulic press, it overcomes all handicaps of hydraulic presses as you know them.

The extreme flexibility of this new and better hydraulic press is due to the fact that the stroke is controlled not by distance or mechanical limitations but by a pre-determined pressure setting. When the maximum pressure (for which the press is set) is reached, the ram automatically returns to the starting point, regardless of how far it has advanced. For this reason, neither the H-P-M Hydro-Power press nor the dies can be damaged when a careless operator inserts two or three blanks instead of one. When a mechanical press is being used, such thoughtlessness would result in breaking the press or smashing the dies.

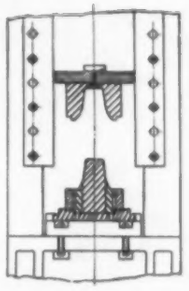


Fig. A A typical set-up on the H-P-M Hydro Power Press for deep drawing work. The variable working stroke can be quickly adjusted to suit the particular requirements of each job.

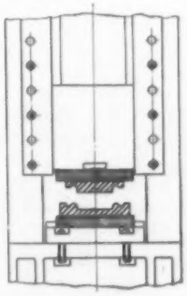


Fig. B A typical set-up for a shallow stamping job. By merely changing the dies and adjusting the pressure, the H-P-M Hydro-Power Press can be prepared to handle a variety of work.

10 Other Operating Advantages

(1) Interchangeability of dies
(2) Easy die set-up
(3) Direct-reading pressure gauge
(4) Full pressure at top of stroke
(5) Pressure controlled automatically
(6) Non-breakable (press or dies)
(7) Operator fully safeguarded
(8) Dies automatically protected
(9) Die life greatly lengthened
(10) No auxiliary pressure system required

"Making Good" in Many Plants

The H-P-M Hydro-Power Press was engineered in 1927 and is now an important production factor in many plants throughout the U. S. Write for catalog 30-A-1 which describes this sensational new press in detail.

THE HYDRAULIC PRESS MFG. CO.

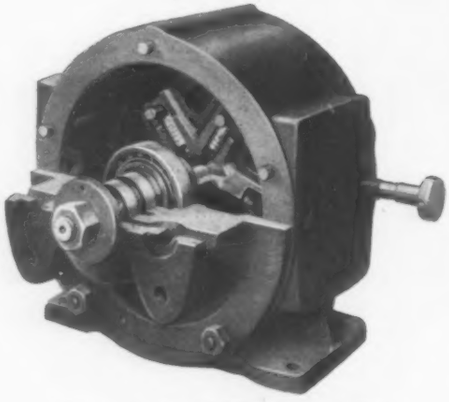
Columbus, O. — 20 East Broad
Mount Gilead, O. — (Suburban to Columbus)
New York — 220 Broadway

H-P-M HYDRO-POWER

Copyright 1930 T.H.P.M. Co.

Trade mark "Hydro-Power" reg. U. S. Pat. Office

Hydraulic Smoothness with the HELE-SHAW



Cut away view of High Pressure Hele-Shaw Hydraulic Pump

SURELY, steadily, quietly, with liquid smoothness, Hele-Shaw Hydraulic Pumps go about their work, providing easily controllable power for drives of all kinds.

Without effort, they build up pressure to overcome resistance that would cause gearing to clash and grind, but they do it under such perfect control that no excess pressure ever can be applied to break tools or machines.

The Hele-Shaw Pump operates on a principle of balance. Pressure in the fluid system, automatically controlled, invariably balances the resistance to be overcome up to the limit of the pump's capacity. As a result, operation is continuous, without pulsation, at a constant speed regardless of the pressure or speed at which the machine it drives is operated.

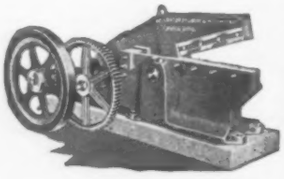
Write for booklet describing the many uses of Hele-Shaw Pumps.

AMERICAN FLUID MOTORS COMPANY

2410 Aramingo Avenue Philadelphia, Pa.

Canton Alligator Shear

Solid Steel Throughout



If you cut bars, sheets, or scrap, you can save money both in power and operating costs by installing a Canton All Steel Alligator Shear.

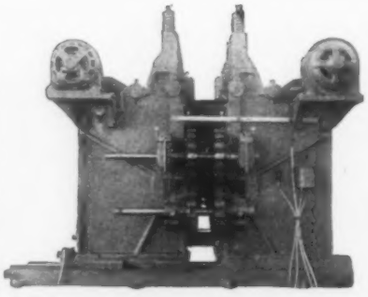
Its solid steel construction assures you of many years of profitable service.

Write for catalog and prices

Canton Foundry & Machine Co.

Canton Ohio

New York Office Carnegie Hall, 154 West 57th St.



CONTINUOUS SHEET AND TIN MILL SHEARS

SQUARING SHEARS GANG SLITTERS

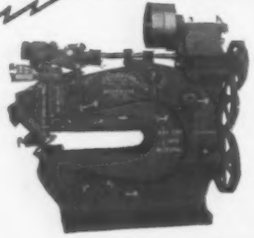
CORRUGATING AND CRIMPING MACHINES

ROOFING MACHINERY

The Streine Tool & Manufacturing Co.

NEW BREMEN, OHIO

QUICKWORK



ROTARY SHEARS

—cut square and beveled edges in straight or irregular shapes, cut and flange circles, joggle, etc. One "QUICKWORK" replaces several old standard machines and does work they will not do. Made in many sizes for all gauges up to 1".

Write for Catalog No. 80

THE QUICKWORK COMPANY

(NOT INCORPORATED—H. COLLIER SMITH, OWNER)

ST. MARY'S, OHIO, U. S. A.

Cable Address: "QUICKWORK." All standard codes used.

R. S. NEWBOLD & SON COMPANY

Straighteners & Levellers — Shears

Mill Tables — Pipe & Tube Bending & Cutting Machinery

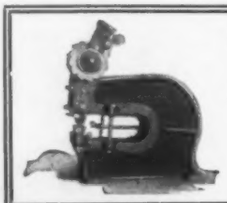
Washer Punches — Contract & Special Machine Work

Tanks — Stacks — Fabricated Plate Work

53 PARK PLACE, NEW YORK CITY

140 WASHINGTON ST., NORRISTOWN, PENNSYLVANIA

400 UNION TRUST BLDG., PITTSBURGH, PA.

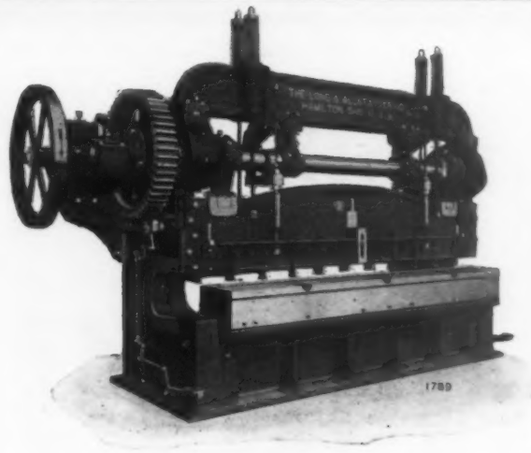


BELOIT LEVER PUNCH

Designed for the heaviest work. Quickly changed to work with or without ratchet. 4" to 15" throat. Will punch ½" hole through ¾" iron or equivalent. Get our complete catalog.

HENDLEY and WHITTEMORE CO.

Blackhawk Blvd., Beloit, Wisconsin



Gate or Squaring Shear

Power Punching and Shearing Machinery

POWER PRESSES PRESS BRAKES
Coping and Bending Machines
Spacing Tables
STAKE RIVETERS HAMMERS

THE LONG & ALLSTATTER CO.
HAMILTON, OHIO

Have You Investigated the Beatty No.9 Structural Punch?

It has plenty of die space to make combination set-ups, and reduces the number of floor passes (often from four to one). It has the very widest range of possible work and simplifies many operations.

We'll be glad to send you the complete story on it. Write us.

BEATTY MACHINE & MFG. CO.
150th and Oak Street,
HAMMOND, IND.

BEATTY NO. 9 PUNCH AND SHEAR

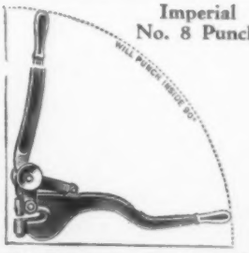
No. 10 Ball Bearing Punch

Weight 8½ lbs. Capacity ⅝-inch hole through ¼-inch iron.

No. 24 Ball Bearing Punch

Throat depth 3½ inches, capacity ½" hole through ⅝" iron, weight 45 lbs.

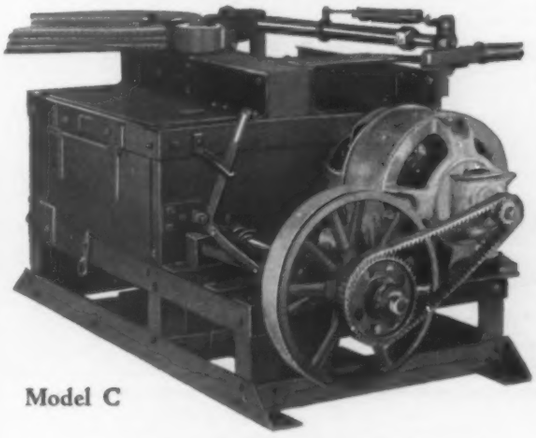
Imperial No. 8 Punch



Operating handles will not become disengaged. Roller Bearing. This style made in 3 sizes Nos. 7-7½-8. Weight 16 lbs.; capacity ¼" through ¼" iron.

Write for Catalog of Entire Line

WHITNEY METAL TOOL CO.
100 FORBES ST. ROCKFORD, ILLINOIS



Model C

THE KARDONG CIRCLE (Silent Chain Drive) BENDER

Circles of any size required in reinforcing work from 18" in diameter up can be made on this bender. Changes of radius can be made in the same circle, without stopping machine with lever adjustment. Where speed and large capacity are required this machine will give unfailing satisfaction. It is the right machine for the fabricator having a heavy tonnage of reinforcing circles. As high as five one-half inch Bars can be bent in one operation.

Ask for catalogue of our complete line of reinforcing steel benders.

KARDONG BROTHERS, Inc.
MINNEAPOLIS, MINN.

. . SMITH . .

Unbreakable Steel Plate Frame

Punching and Shearing Machines

. . . cut costs, boost profits

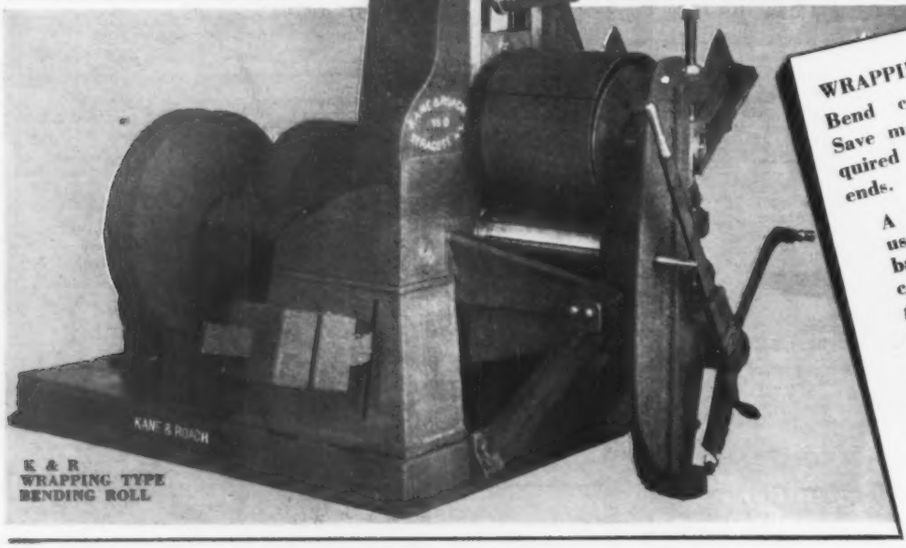
Bending Machines for rolling Angles, Beams, Channels, etc.

. . . famous for accurate work

David H. Smith & Sons, Inc.
Representatives in All Principal Cities of U. S. A. and Canada
Foot of 51st St. . . . . Brooklyn, N. Y.

Kane & Roach build of Bending Rolls

"GENERATOR CASING BENT TO TRUE CIRCLE"



K & R WRAPPING TYPE BENDING ROLL

WRAPPING TYPE ROLLS

Bend complete to ends. Save material and time required to remove the flat ends.

A production Roll used for: brake bands, roller bearing casings, motor and generator frames, gear ring blanks, auto rims, steel pulleys, tractor and trailer wheels, mufflers, cylinders, angles, special flanged shapes, etc.

Send Us Your Problems

"Typical Work Produced"

KANE & EST.

Syracuse,

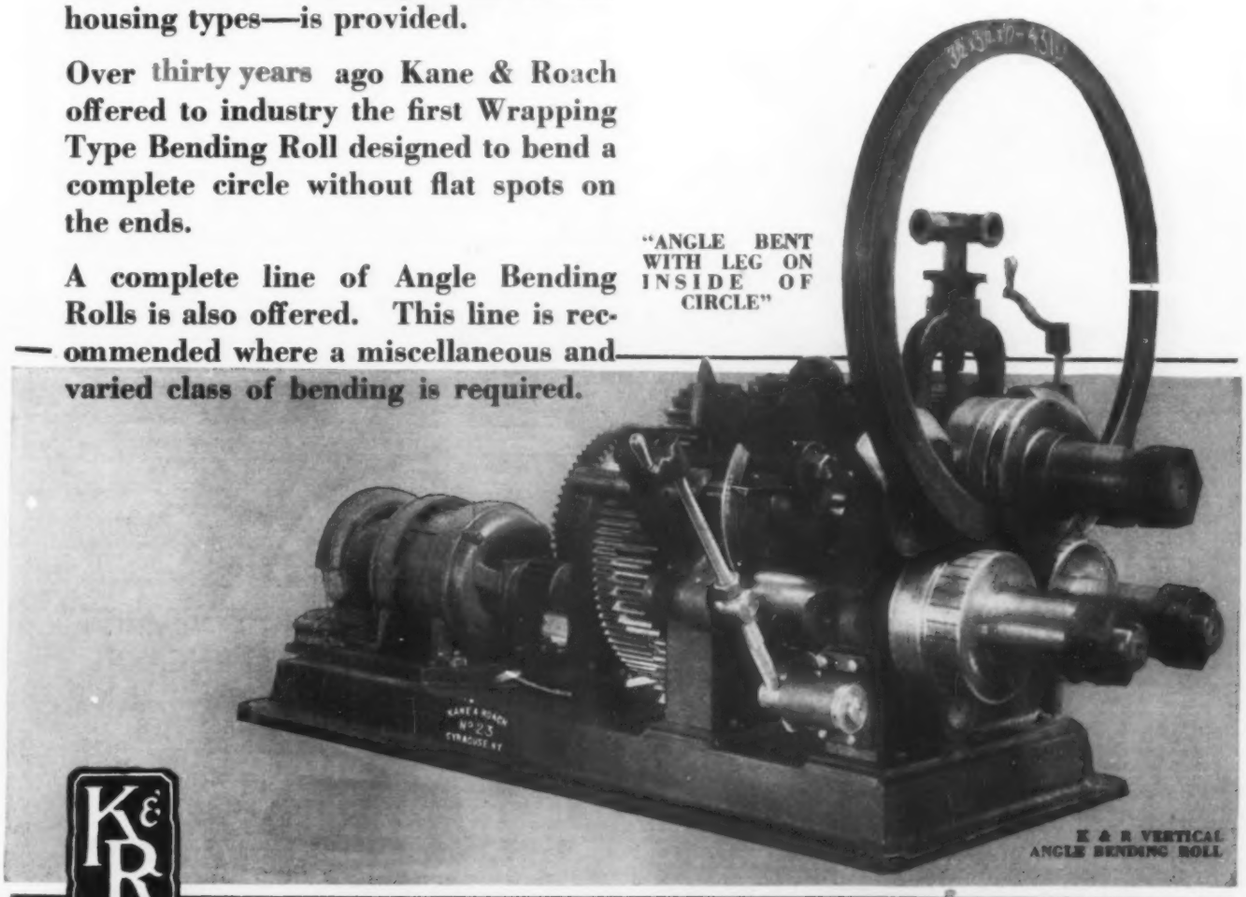
"Straightening Rolls, Bending Rolls,

a complete line

PIONEERS in the bending field, Kane & Roach have kept ahead of the wide industrial requirements. A machine for every modern requirement—both in the single and double housing types—is provided.

Over thirty years ago Kane & Roach offered to industry the first Wrapping Type Bending Roll designed to bend a complete circle without flat spots on the ends.

A complete line of Angle Bending Rolls is also offered. This line is recommended where a miscellaneous and varied class of bending is required.



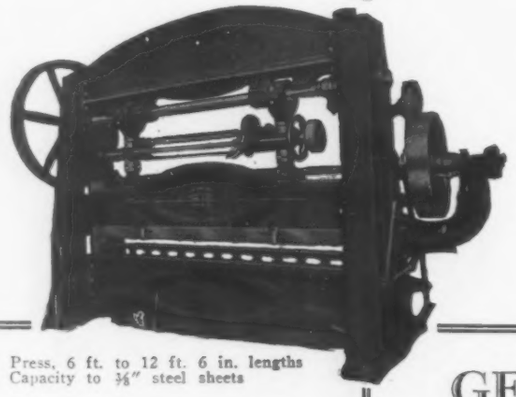
"ANGLE BENT WITH LEG ON INSIDE OF CIRCLE"

K & R VERTICAL ANGLE BENDING ROLL

Legs of Angle Held Square—at 90°—with One Another

ROACH
1887
New York
Cold Roll Forming Machines"

HERE'S *What you can do on this OHL-10 Ft. Power Brake*



Press, 6 ft. to 12 ft. 6 in. lengths
Capacity to 3/16" steel sheets

—Bend a ten-foot sheet of No. 10 gauge steel—or, form skylight bars of No. 26 gauge steel in two operations. The seven members are bent in one operation and the bar squeezed together in the next.

This OHL Power Brake is equipped with a new method of holding dies, is amply proportioned, and heavily constructed, and includes a patented friction gear.

We'll be glad to go over this machine with you point for point and explain how economical—and simple—it is to operate.

GEORGE A. OHL & CO., Inc.

Originators of Sheet Metal Working Machinery Since 1863

151-161 Oraton St. **Newark, N. J.**

Crimping and Hammering Machines — Slitting Shears—Power Presses.

Double Cam Brakes—Slip Roll Formers—Squaring Shears—Mitre Cutters—

HANNA RIVETERS

HANNA ENGINEERING WORKS
1761 ELSTON AVE., CHICAGO, ILL.
BIRMINGHAM, ALA. LOS ANGELES CLEVELAND OHIO DETROIT
NEW YORK RICHMOND, VA. SAN FRANCISCO ST. LOUIS

ALLEN RIVETERS

VARIOUS TYPES AND SIZES
FOR ALL RIVETING PURPOSES
JOHN F. ALLEN CO.
372 GERARD AVENUE NEW YORK

HAND BRAKES
POWER BRAKES
PRESS BRAKES
POWER SQUARING SHEARS

COMPLETE LINE OF SHEET AND PLATE BENDING AND SHEARING MACHINES FOR LIGHT SHEETS OR PLATES UP TO ¼" THICK.

OVER 30,000 USERS
WRITE FOR LITERATURE

DREIS & KRUMP MFG. CO.

7430 LOOMIS ST., CHICAGO

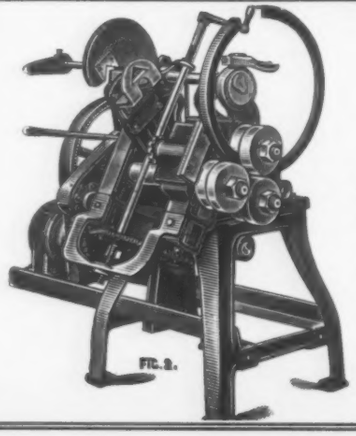


FIG. 2.

CIRCULAR ANGLE BENDING MACHINE No. 14

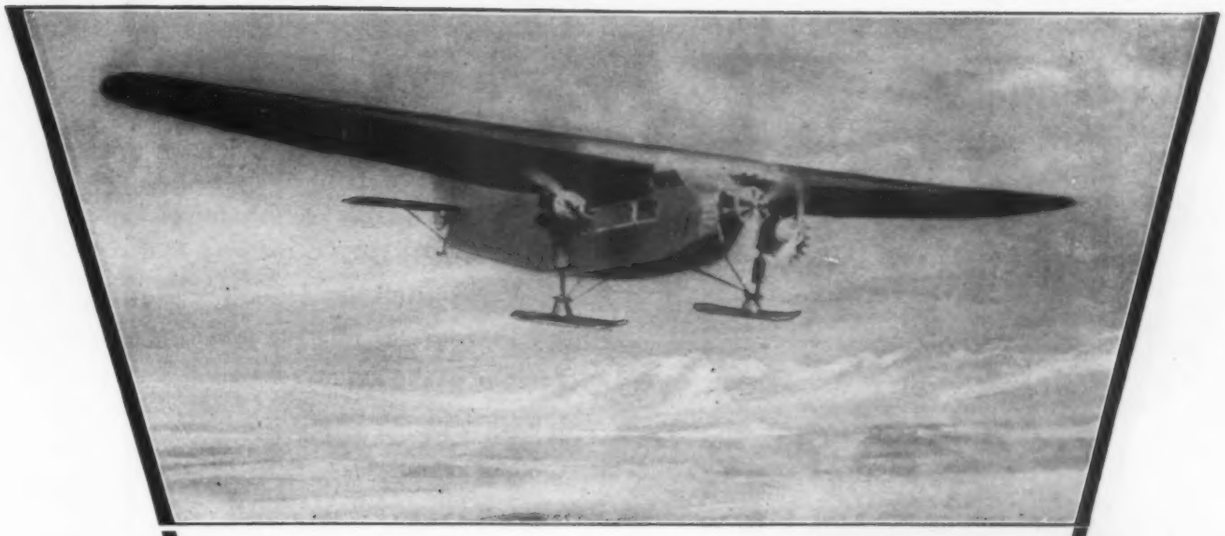
Capacity up to 2 in. Angle Iron 10 in. to 10 ft. circles
With or without cut-off attachment; belt or motor driven.

True circles can be formed on this Machine free from twist.
We are designing a Machine to bend into circles, U or S shape, 4" x 4" angle iron or under.
Your inquiries solicited.
Also manufacturers of Automatic Grinding and Polishing Machines, Crushers, Pulverizers, Power Shears, Presses, Punches, Brakes, etc.

Write for Descriptive Circulars

EXCELSIOR TOOL & MACHINE CO.

EAST ST. LOUIS, ILL.



90° South Latitude
(The South Pole)

IN the Byrd Flight over the South Pole, every pound counted. They needed a cooking outfit, lighter than any that they had in Little America.

80° Below Zero
(Atmosphere Temperature)

MR. CZEGKA, "the man who could make anything out of metal", with his complete Airco-Davis-Bournonville oxyacetylene welding equipment, Airco Oxygen and Acetylene, welded one of aluminum which just filled the bill.

6300° Above Zero
(Oxyacetylene Temperature)

FOR emergency, production or repair work the noteworthy performance of Airco-Davis-Bournonville welding and cutting torches and accessory oxy-acetylene equipment has established them as a standard of excellence since the beginning of the industry.

Write or phone any Airco office for suggestions as to what they can do for you.

AIR REDUCTION SALES COMPANY

Lincoln Building, East 42nd Street, N. Y. C.

Airco Oxygen—Airco Acetylene—Airco-National Carbide—Airco-Davis-Bournonville Welding and Cutting Apparatus

AIRCO DAVIS-BOURNONVILLE

Airco Offices
Baltimore
Bettendorf, Ia.
Birmingham
Boston
Buffalo
Charlotte
Chicago
Cincinnati
Cleveland
Dayton
Detroit
Emeryville, Cal.
Jersey City
Los Angeles
Louisville
Milwaukee
Minneapolis
New Orleans
Oklahoma City
Philadelphia
Pittsburgh
Portland, Ore.
Richmond
Seattle
Shreveport, La.
St. Louis
Wheeling

90 Plants—125 Distributing Stations

PERFORMANCE

A Harris Multi-Stage Regulator completing a full cycle of *performance* every **THREE SECONDS** nine hours per day, week in and week out, with no repair expense nor interruption, is so used in one of the nation's foremost Development Laboratories.*

This regulator is a *stock* model.

Each **THREE SECONDS** it delivers 15 lbs. pressure, cuts off and repeats.

That IS Performance

THE HARRIS CALORIFIC CO.
CLEVELAND, OHIO

* *Name on Request*

MULTI COPYRIGHTED STAGE

AVAILABLE FOR ALL GASES—WELDING AND CUTTING

ACETYLENE
OXYGEN
HYDROGEN
NITROGEN
PRIMOGAS
I.O.C. SYSTEM

INTERNATIONAL
WELDING AND CUTTING EQUIPMENT
EYEOSEE

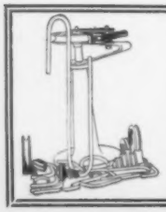
INTERNATIONAL OXYGEN COMPANY
General Offices: Newark, N. J.
Branches: New York, Pittsburgh, Toledo, Buffalo,
New England Division
The Tariffville Oxygen Company, Tariffville, Conn.

THOMSON-GIBB
WELDERS

SPOT—BUTT—SEAM
PROJECTION—FLASH
AND SPECIAL TYPES

We maintain a staff of experienced sales engineers and service men in all important industrial districts.

THOMSON-GIBB ELECTRIC WELDING CO.
LYNN, MASS. BAY CITY, MICH.



1 of 21 Sizes and Types of Hand and Motor Operated *Cold Pipe* Bending Machines we make bending ¼" to 8" Pipe.

Cost of Bending					
1"—3 cents	2"—5 cents	3"—20 cents	4"—40 cents	6"—80 cents	8"—$1.00

Over 8,000 in use. Send for catalog.
Pipe Threading and Cutting Machines ½" to 16".
AMERICAN PIPE BENDING MACHINE CO., Inc.
31 Pearl Street, Boston, Mass.

SPOT-BUTT-SEAM
PORTABLE
TAYLOR-WINFIELD WELDERS
For labor-saving lower-cost production
The TAYLOR-WINFIELD CORP., WARREN, O.

A Federal Welder for Every Job

THE 600 series Welders may be used for automatic **Spot or Projection** welding. They can be obtained in throat depths of 12", 24" and 36" and transformer capacities of 75 to 175 K.W. The operation of this type of welder is entirely automatic. We would like to send our **New Bulletin No. 270** which shows our 600, 700, 800 and 900 series Heavy Duty Automatic **Spot** and **Projection** welders. Picture to right shows a 624 Heavy Duty Spot Welder for 2 pieces of ⅜" each thick steel.

The Double No. 81 Special Rear Axle Housing Butt Welder welds both flanges in one operation at a rate of 60 Housings per hour. Federal Engineers can work out similar problems for you.

In the lower right hand corner is a special air operated Spot Welder.

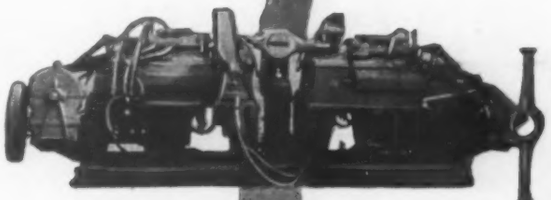
Below is a Series 80 Butt Welder; these welders can be obtained with hand or air clamping, and hand, hydraulic or mechanical upset. This type of welder is designed to especially weld rims, hub shells and the like with a production of 200 to 450 pieces per hour. They are built with transformers of the **Federal-Flashproof** design from 100 to 300 Kilowatts. Write for **Bulletins Nos. 80 and 82.**

Below and at the left is a **Federal Junior Automatic Spot Welder** capable of making from 50 to 200 spots per minute on from 11 to 20 gauge. This welder is built in two general styles, one for foot operation, the other for foot or power operation. They are constructed to supply the demand for a small yet rugged production welder for two pieces of ⅛" thick steel. Throat depths 12 to 24" inclusive, transformer capacities 10, 12½, 15 and 20 Kilowatts. Write for **Bulletin No. 250** and see the different metals this welder will weld.

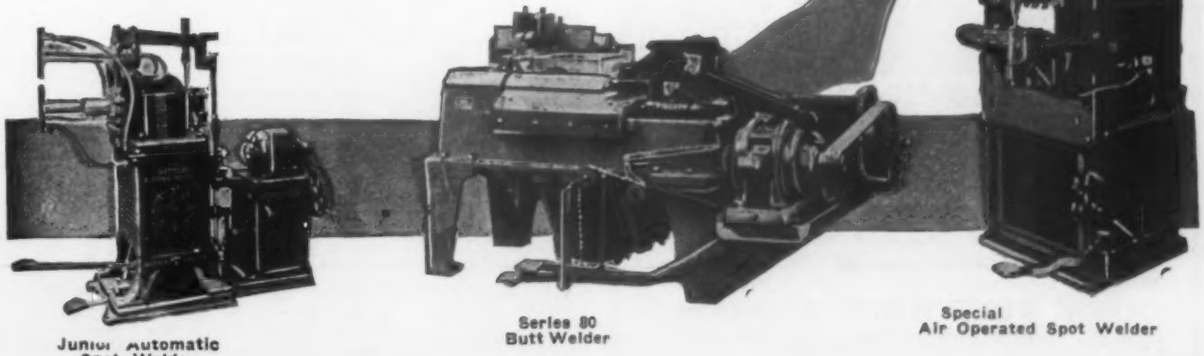
THE
Federal
MACHINE AND WELDER COMPANY
WARREN, OHIO, U. S. A.

Branch Offices in Principal Cities

600 Series
Spot Welder



Double
No. 81 Butt Welder

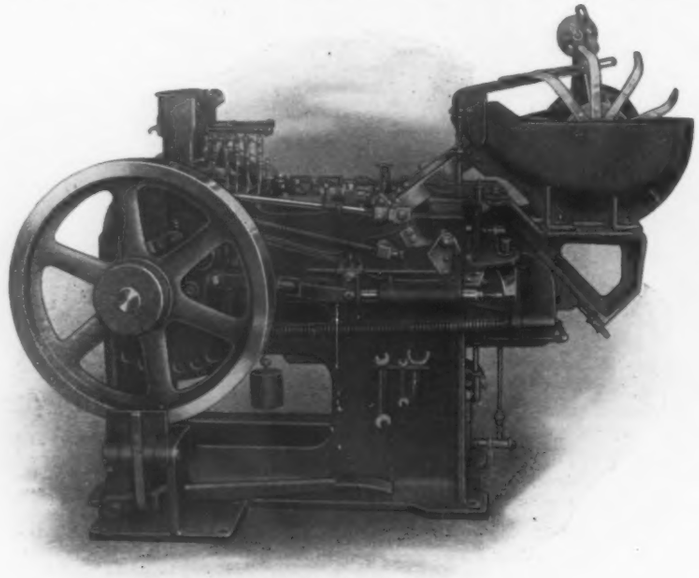


Junior Automatic
Spot Welder

Series 80
Butt Welder

Special
Air Operated Spot Welder

MANVILLE NEW MODEL HIGH SPEED CAP SCREW TRIMMER



THE MANVILLE No. 370-D AUTOMATIC

Cap Screw Trimmer is a new High SPEED Automatic Machine for trimming 3/8" dia. up to 2½" long Machine or Cap Screw blanks hex, square or round at 145 blanks per minute.

THE E. J. MANVILLE MACHINE CO., WATERBURY, CONN., U.S.A.

BUILDERS OF COLD HEADERS—BOLT HEAD TRIMMERS—THREAD ROLLERS—SCREW SLOTTERS—COLD PRESSED NUT MACHINES—AND VARIOUS OTHER SPECIAL MACHINES FOR THE RAPID AND ECONOMICAL PRODUCTION OF COLD FORGED PRODUCTS.

BRANCH OFFICES

1209 SWETLAND BLDG., CLEVELAND, OHIO STEPHENSON BLDG., DETROIT, MICH.

AGNEW WELDERS

ELECTRIC SPOT, BUTT & SEAM WELDERS
STANDARD & SPECIAL
WIRE WELDERS A SPECIALTY

AGNEW ELECTRIC WELDER CO.

Manufacturers of Electric Welding Machines since 1905
MILFORD, MICH.

WIRE MACHINERY

Equipment for

SPRING MAKING
SPECIAL COILING
CABLE ARMORING
LOCK WASHERS
NAILS & STAPLES
WIRE DRAWING
WIRE ROLLING

SLEEPER & HARTLEY, Inc.
WORCESTER, MASS.

Imperial

Oxy-Acetylene
WELDING AND CUTTING EQUIPMENT

Outfits, Torches and Automatic Acetylene Generators
The Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago.

ELECTRIC WELDER Co.

Manufacturers of **BUTT AND SPOT WELDING MACHINES, HAND AND AUTOMATIC**
Office: Boulevard Temple Bldg., W. Grand Blvd. at 12th St., Detroit, Mich.
Factory: 817 S. Leighton St., Kenton, Ohio.

THE CRACKERJACK

A simple, practical, Automatic Wire Straightener and Cutter. Takes the wire from the coil, makes it perfectly straight and cuts accurate lengths. Will pay for itself in a month.

Booklet 'C" tells all about it.

THE FRANKLIN MFG. CO. New Haven, Conn.

COOK CAP SCREW MACHINES

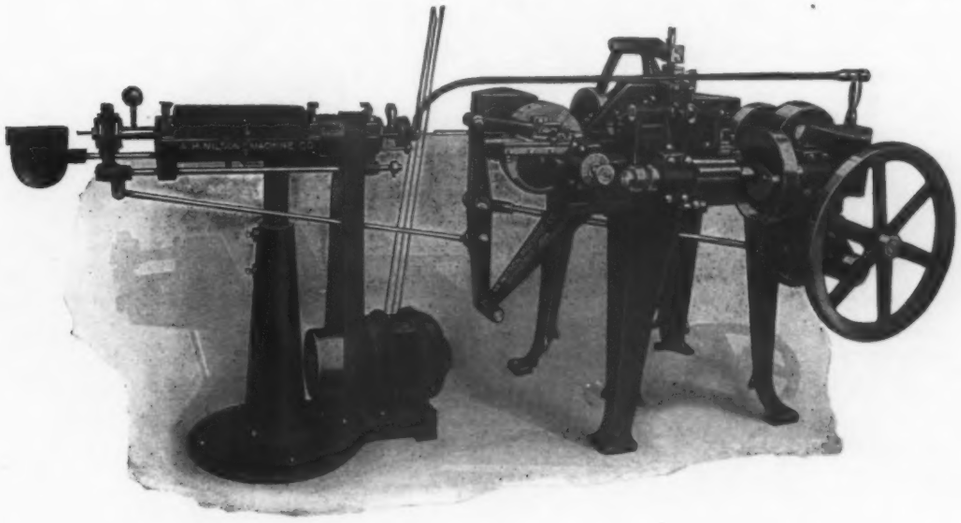
for shaving CAP SCREWS under and over the head in one operation.

COOK WOOD SCREW MACHINES

For making IRON AND BRASS WOOD SCREWS.

THE ASA S. COOK CO., HARTFORD, CONN.

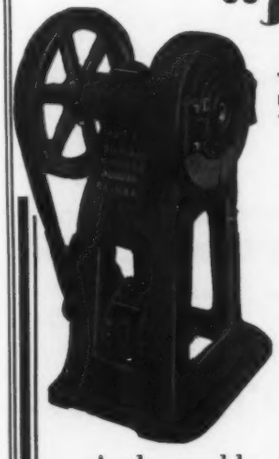
The **NILSON**
FOUR SLIDE WIRE FORMING MACHINE



THIS is the latest improved Nilson Four Slide Machine, connected with an Oscillating Wire Straightener which can be driven either by a motor or countershaft. The Roll Straightener is most commonly used, but if the wire must be perfectly straight it is necessary to use an Oscillating Straightener. The arbor, in the Straightener illustrated, is so constructed that it is only necessary to insert the end of the wire in it, then push the wire, and it will go through the arbor block itself and come out straight, providing the blocks are properly adjusted. Manufacturers have long felt the need of a portable Straightener of this kind, which can readily be moved from one machine to another as required.

THE A. H. NILSON MACHINE COMPANY - - Bridgeport, Conn.

"STANDARD" SWAGERS



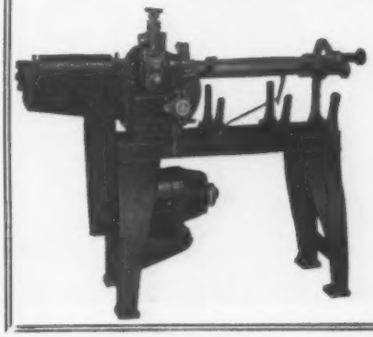
Model 2A

A thoroughly satisfactory machine in every feature. Rigidly constructed, with Oil Reservoir and Long Bronze Bearings, every wearing part is Renewable. It is equipped with a heavy spindle and is well adaptable to Motor drive. Its capacity is from 0" to 4¾".

Your inquiries are solicited.

STANDARD MACHINERY CO.
Auburn, Rhode Island

WIRE STRAIGHTENING and CUTTING MACHINES



Timken Roller Bearings

Texrope Motor Drive

Sizes up to ⅝"

Built for Hard Service

The LEWIS Machine Co.
1600 E. 24th St.,
Cleveland, Ohio

THE
DAYTON
TORRINGTON
SWAGING MACHINE

—with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Modern Art of Swaging."

The Torrington Co., Excelsior Plant
55 Field Street Torrington, Conn.

SOMETHING

to consider: Rolled Threads are accurate in lead and basic diameter; they are regular in profile—not rough or ragged. Another fact

ABOUT

Rolled Threads is that they are strong—they are forged in the surface metal without disturbing the softer core. The structure of the surface metal is not cut into, but is strengthened by the process.

THREAD ROLLING

is the fastest method of producing screw threads and the most economical—there is no waste of metal.

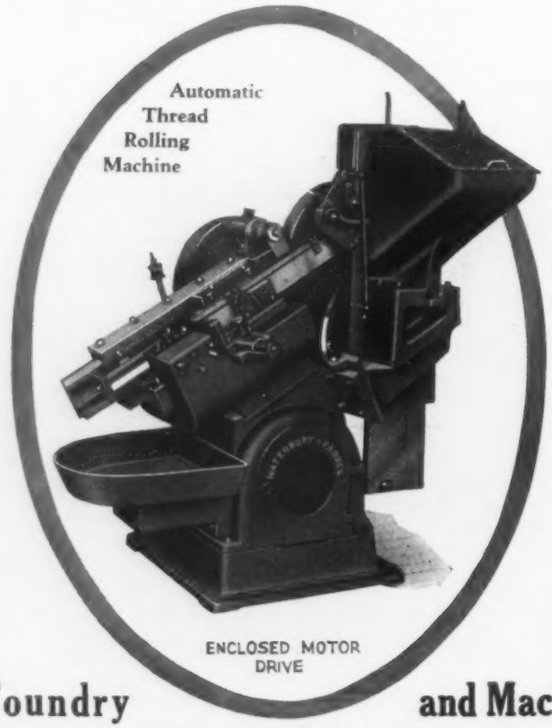
AND

the dies used will give long service without destroying the accuracy of the thread. Daily grinding of tools to a gage is not required to maintain the thread shape.

THREAD ROLLERS

are of two types: Automatic Inclined in six sizes, the largest of which will roll a ⅝-inch thread 4 inches long; Hand-fed Horizontal in eight sizes with maximum capacity for 1 inch diameter threads, 5 inches long. Belt or motor drive.

Waterbury-Farrel



HEADERS

For all kinds of cold upsets. Complete range of sizes up to 1 inch diameter wire.

TRIMMERS

For trimming cold-headed blanks to the desired shape. Automatic high-speed machines in three sizes—¼, ½ and ¾ inch wire.

SLOTTERS

High speed, quantity-production machines. Sizes: Nos. 5, 10, 20 and 30 machine screws.

NUT MACHINES

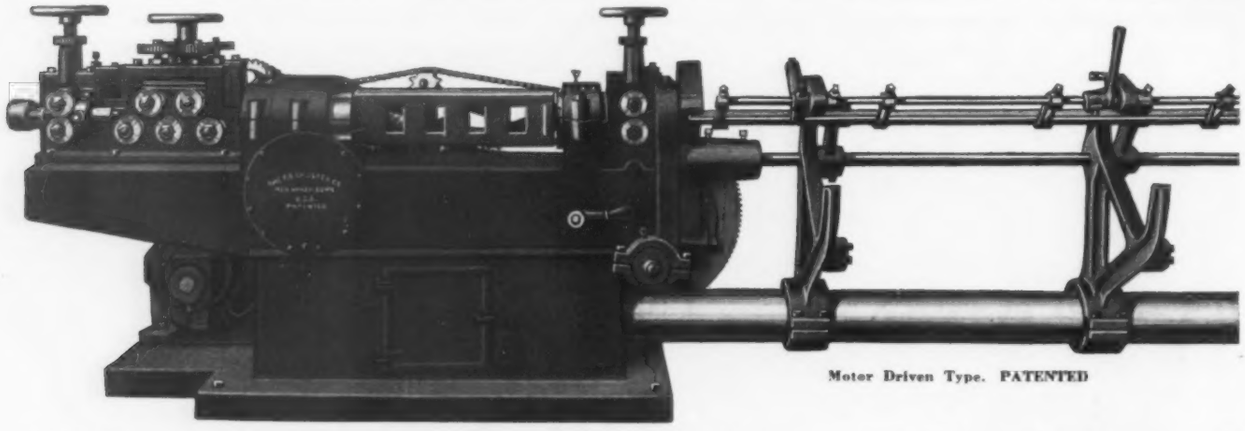
For making chamfered and pierced nut blanks from the coil or bar. Fully automatic. Capacities for ¼, ⅜, ½ and ⅝ inch U. S. Standard nuts.

OTHERS

Rod Headers, Ball Headers, Double-end Headers, Rivet Drilling Machines, Rivet Splitting Machines, Gimlet or Wood Screw Pointing Machines, etc., etc.

Waterbury Farrel Foundry and Machine Company

HOME OFFICE AND WORKS: Bank and Meadow Sts., Waterbury, Connecticut
WESTERN SALES OFFICE: 736 Bulkley Building, Cleveland, Ohio



Motor Driven Type. PATENTED

Wire Straightening Your Problem?

Our experience covers 64 years studying the requirements of the trade, and the best way to meet them, and we can give you valuable assistance in cutting down your production costs. . . . Sturdy Machines which stand up to their work permanently, and pay for themselves in a short time. Timken Bearings, Texrope to motor, etc. Up-to-the-minute Machines in every respect. High production Machines. . . . Made in many sizes, and for ALL KINDS of wire.

THE F. B. SHUSTER CO., New Haven, Conn.
Straightener Specialists Since 1866

....Consult SHUSTER

There's No Substitute For 50 Years' Experience

We manufacture 25 types of machines with capacities from pin-pointing to swaging 5" diameter stock.

Just a Few of Our Customers

Aluminum Co. of America
American Brass Co.
American Chain Co.
American Optical Co.
American Steel & Wire Co.
Atwater Kent Mfg. Co.
Baldwin Locomotive Works
Bausch & Lomb
Bell Telephone Co.
Bethlehem Steel Co.
Bristol Co.
Brown & Sharpe Mfg. Co.
Carrier Eng. Corp.
Celotex Co.
Clark Equipment Co.
Crucible Steel Co.
Cushman Chuck Co.
Eastman Kodak Co.
Elliott Fisher Co.
Ford Motor Co.
Frigidaire Co.
General Electric Co.
General Motors Co.
Gillette Safety Razor Co.
R. Hoe & Co.
Hoover Co.
Hyatt Roller Bearing Co.
International Harvester Co.
International Silver Co.
Kraeuter & Co., Inc.
Mechanics Universal Joint Co.
Morse Twist Drill & Mch. Co.
National Cash Register Co.
Ohio Seamless Tubing Co.
Packard Motor Car Co.
Pratt & Whitney Aircraft Co.
Remington Typewriter Co.
Saco-Lowell Shops
Scovill Mfg. Co.
Singer Mfg. Co.
Spicer Mfg. Co.
Standard Pressed Steel Co.
Starrett Co., L. S.
Steinway & Sons
Stewart-Warner Co.
Superheater Co.
Syracuse Washing Machine Co.
Thompson Products Co.
Union Carbide Laboratory
United Shoe Machinery Co.
Victor Talking Machine Co.
Waterman Co., L. E.
Western Clock Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
Whitney Carriage Co., F. A.
Willys-Overland Co.
Wilson Foundry & Machine Co.

Join the Swing to Swaging!

This machine will save $500 a day in metal alone.

(These are the manufacturer's own figures.)

This machine is increasing production—just slashing costs—and turning out a much better job.

How about *your* work?

Let our swaging experts tell you how we can make more money for you.

You will be surprised at the range of work our swaging machines can do. Big, heavy work—hot or cold—and closely accurate because of our automatic holding and feeding devices.

Just write us about any work you think *might* be swaged.

Not the slightest obligation on your part, of course.

Write us today—your letter will be profitable to you and more than welcome to us.

SWEDGE AND SAVE

LANGELIER MANUFACTURING CO., PROVIDENCE, R. I., U. S. A.

Designers and builders of Hot and Cold Swaging Machines, Hammering Machines, Sensitive Drills, Multiple Spindle Drilling and Tapping Machines, Multiple Spindle Attachable Drill Heads, Automatic Drilling and Tapping Units. There's no substitute for 50 years' experience!

ONE OPERATION DOES TWO JOBS

Each hour 300 steel gear oil tubes are reduced and sized in one operation by a single

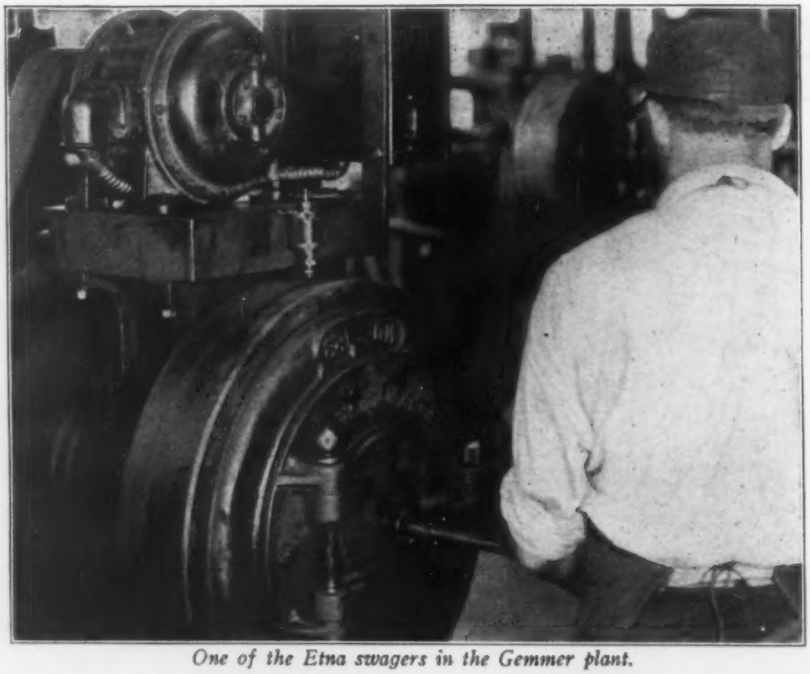
ETNA SWAGER

Production is increased and costs reduced by a battery of Etna Swaging machines in the plant of the

GEMMER MFG. CO.

OF DETROIT

Write us for production estimates.



One of the Etna swagers in the Gemmer plant.

THE ETNA MACHINE COMPANY

TOLEDO . . . . . OHIO

ATLAS

INDICATING AND RECORDING

DIAL SCALES

The Atlas Indicating and Recording Mechanism has been developed to indicate and record, accurately and dependably, the weight of bulk materials transported on scale cars. Easily attached to equipment in operation. Electrically operated, and eliminates any possible errors or pernicious manipulation.

The cut at the left shows an installation on a 25 ton Side Dump Double Compartment Charging Car, with Elevated Operating Platform. This is but one of the many pieces of ATLAS Haulage Equipment on which it is standard equipment.

Write for Bulletin No. 1225.

The ATLAS CAR AND MFG. CO.

ENGINEERS *MANUFACTURERS*

1140 Ivanhoe Rd., Cleveland, Ohio

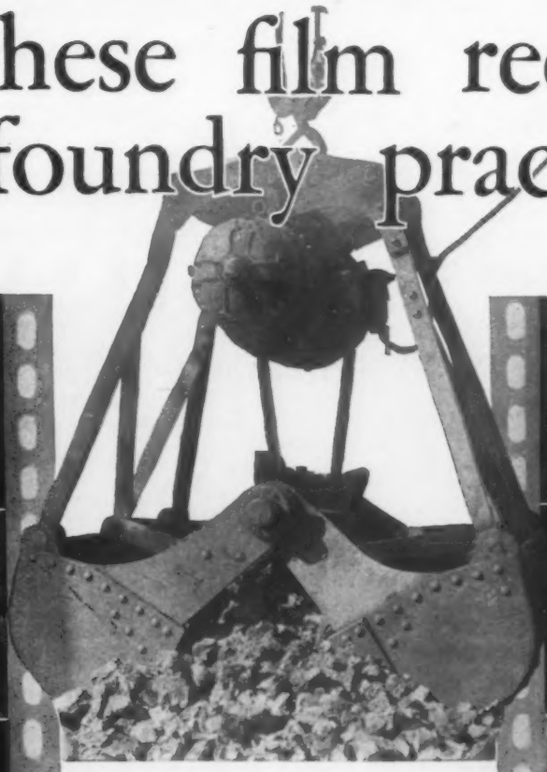
See these film records of foundry practice

HANDLING BULK MATERIALS *with* HAYWARD ELECTRIC MOTOR BUCKETS

This Hayward Electric Motor Bucket is proving very valuable in one of the largest foundries in the East handling sand, scrap, and in digging pits.

A close-up of a Hayward Electric Motor Bucket handling sand in the foundry of a prominent automobile manufacturer.

Hayward Electric Motor Bucket shown is unloading foundry materials from cars.



A bucket is not worth its salt until it's on the move. Pictures of buckets, too, must show action, if they are to give any worthwhile idea of a bucket's real value.

For just this reason, Hayward engineers got busy with the movie camera. They took movies showing Hayward Buckets at work in several fields. Movies of the Hayward Electric Motor Bucket in action in leading foundries—handling foundry sand, ore, slag, coal, coke and other bulk materials.

We want you to see these movies. We will gladly run them off in our New York office at any time convenient for you. Let us know when you can come.

* * *

Having four different types of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

THE HAYWARD COMPANY
46-50 Church St., New York, N. Y.

Hayward Buckets

Screening is one of the many processes in which a Hayward Electric Motor Bucket serves foundrymen.

This 1½ yard Hayward Electric Motor Bucket handles sand, coke, coal, limestone, "in fact all foundry materials except iron."

Digging slag is a man's job for any bucket. Above is a Hayward Electric Motor Bucket at work in the slag pit of a steel mill in Ohio.

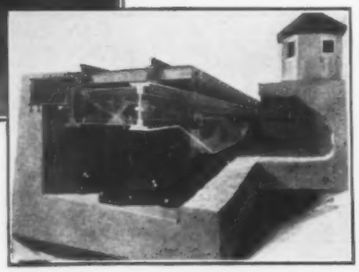
HAYWARD BUCKETS — HAYCO

Orange Peel · Clam Shell
Drag Line · Electric Motor

This suspension bearing...

gives you greater scale accuracy..

over a longer period of time



The Suspension Bearing shown above is one used in the Buffalo Track Scale illustrated at the right. The Suspension Bearings used in Buffalo Motor Truck Scales, although smaller, follow precisely the same principle of design.

THE best way to tell what kind of performance a scale will give you is to check its bearings. No other factor in scale construction has so great an effect on accuracy... any unbiased engineer will tell you that.

And any unbiased engineer who makes a comparative study of scale bearings will also tell you that no other type of bearing in use today equals the simple, low-friction, common-sense design of the Suspension Bearings in Buffalo Scales.

This simplicity means an absence of complicated parts that cause trouble; low-friction means greater sensitivity and greater sensitivity means increased accuracy.

You buy a scale to weigh things. You want to be able to trust it... not just today and tomorrow... but for a lifetime. It's largely a matter of bearing efficiency. Choose a Buffalo Scale, and you buy the utmost in scale satisfaction.

Our literature will give you the proof. Send for it today.

BUFFALO SCALE CO., Inc., 1202 Niagara St., Buffalo, N. Y.

BUFFALO SCALES

"THE TRUSTWORTHY"

NEW YORK DETROIT SYRACUSE DALLAS
PHILADELPHIA PITTSBURGH CLEVELAND CHICAGO

A COMPLETE LINE OF PORTABLE CONVEYORS
A MACHINE for EVERY HANDLING SERVICE
WRITE FOR CATALOGS
PORTABLE MACHINERY CO. CLIFTON N.J.

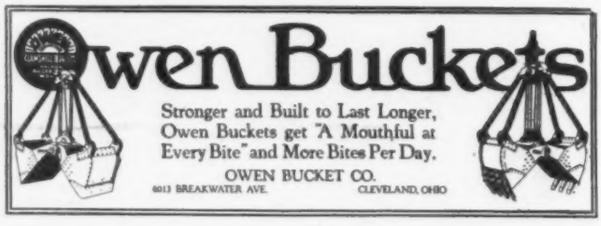
ELEVATORS *Steam Hydraulic*

The Ridgway Steam Hydraulic Elevator is PERFECTION for the man who has steam or air available.

Hundreds in use in Biggest Plants

"HOOK 'ER TO THE BILER!"

CRAIG RIDGWAY & SON CO., COATESVILLE, PA.


Owen Buckets
Stronger and Built to Last Longer, Owen Buckets get "A Mouthful at Every Bite" and More Bites Per Day.
OWEN BUCKET CO.
6013 BREAKWATER AVE. CLEVELAND, OHIO

The Alliance Machine Company

Engineers and Builders of

Electric Traveling Cranes, Electric Charging and Drawing Machines, Electric Bucket Handling Cranes, Electric Traveling Ladle Cranes, Electric Soaking Pit Cranes, Electric Strippers, Hydraulic Machinery, Riveters, Etc.
Rolling Mill Machinery, Scale Cars, Steam Hammers, Charging Larries and Copper Converting Machinery

MAIN OFFICE AND WORKS: ALLIANCE, OHIO

BEDFORD CRANES

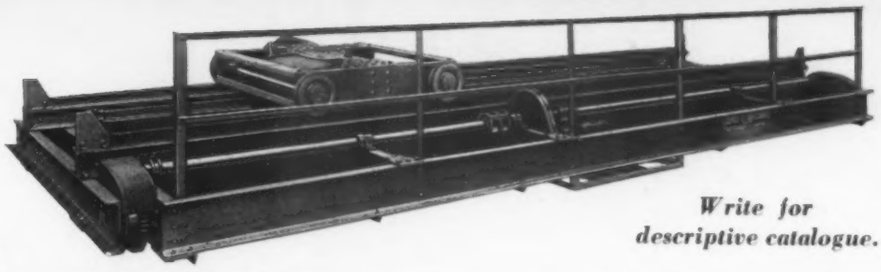
Made in all capacities—Overhead or Gantry—to suit individual requirements. Floor, cage or remote control

Bedford Steel Stiffleg or Guy Derricks.

Bedford Foundry & Machine Co.
BEDFORD, IND.

Conco Cranes

ENGINEERED FOR LOW HEAD ROOM



Write for descriptive catalogue.

ELECTRIC TRAVELING CRANES — HAND POWER CRANES
JIB CRANES — I-BEAM TROLLEYS

for **General Manufacturing Plants—Structural Shops—Packing Plants—Material Yards—Power Plants—Boiler Works—Stone Yards—Ice Plants—Foundries**

CONCO CRANE & ENGINEERING WORKS

MAIN OFFICE & WORKS
730 JEFFERSON ST., MENDOTA, ILL.

DIVISION OF
H.D. CONKEY & COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES

AMERICAN "HY-HOOK" CRANES & HOISTS

AMERICAN CRANE

First to be equipped with roller bearings.
First to be equipped with hardened steel pinions and forged steel gears.
First to adopt all-steel arc welded construction.
The three distinguishing features of all modern cranes.

THE **AMERICAN** CRANE CO., Inc.

FRIENDSHIP, N. Y.

NEW YORK OFFICE, 30 CHURCH ST.

Maris Brothers Electric Cranes

Crane shown is one of many that have been giving satisfaction for the past 15 or 20 years. This crane is installed at a steel foundry where it must be on the job every day operating in dust, dirt, heat and fumes and where it has been giving excellent service despite the hard usage.

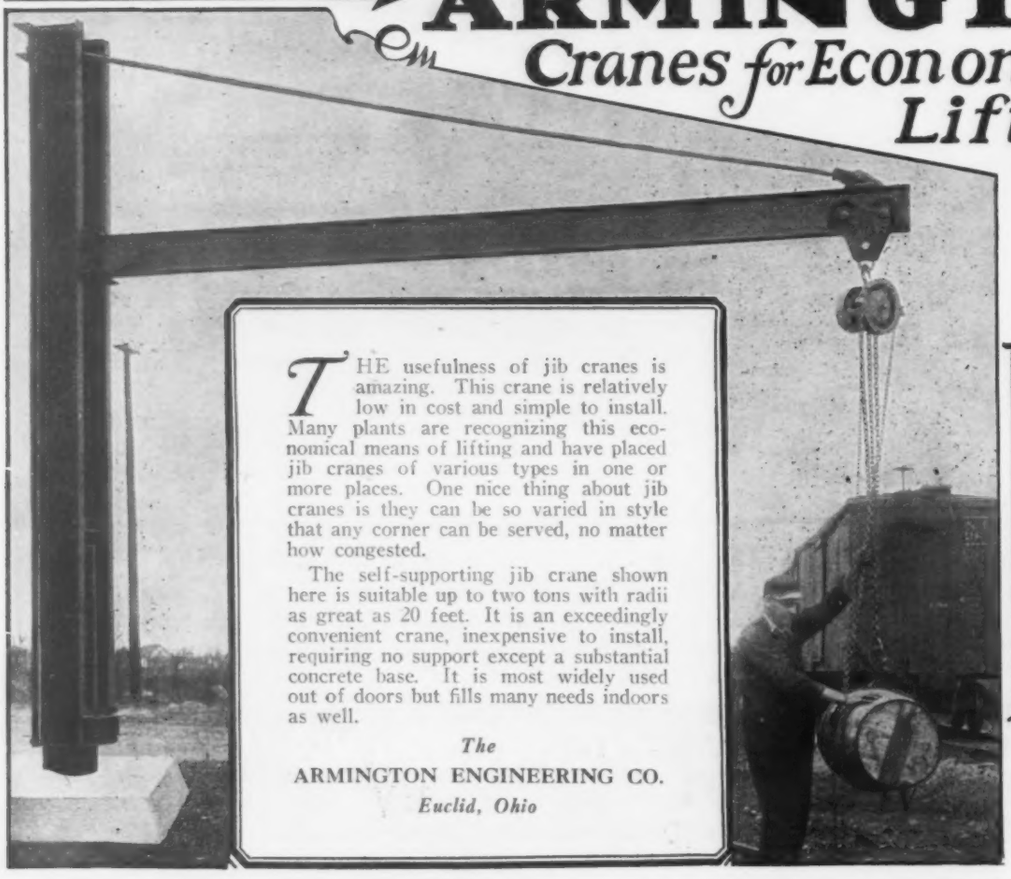
Electric Cranes
Hand Mono-Rail
Electric Mono-Rail

Equipment for Every Hoisting Requirement

Let us send you our catalog; it will help you to select the best type for your purpose.

MARIS BROTHERS, Inc.
5538 Grays Ave., Philadelphia, Pa.

ARMINGTON
Cranes for Economical Lifting



THE usefulness of jib cranes is amazing. This crane is relatively low in cost and simple to install. Many plants are recognizing this economical means of lifting and have placed jib cranes of various types in one or more places. One nice thing about jib cranes is they can be so varied in style that any corner can be served, no matter how congested.

The self-supporting jib crane shown here is suitable up to two tons with radii as great as 20 feet. It is an exceedingly convenient crane, inexpensive to install, requiring no support except a substantial concrete base. It is most widely used out of doors but fills many needs indoors as well.

The
ARMINGTON ENGINEERING CO.
Euclid, Ohio

Let us quote you *on*
TRAVELING CRANES
JIB CRANES
WALL CRANES
PILLAR CRANES
MONORAIL TROLLEYS
Write for Catalog *today*

OHIO
THE CRANE WITH THE 10 YEAR GUARANTEE

STEAM GAS OR ELECTRIC
15 TO 60 TON CAPACITY

LOCOMOTIVE CRANES
GANTRY CRANES, BARGE CRANES, BALLAST CRANES, ERECTION AND LOGGING CRANES
CRAWLER CRANES AND SHOVELS
The Ohio Locomotive Crane Company
BUCYRUS, OHIO

DEPENDABLE
Locomotive Cranes, Gantry Cranes, Flexible-Tread Cranes, Shovels, Draglines and Ditchers, Truck Cranes, Road-Wheel Cranes, Clamshell & Orange-Peel Buckets
ORTON CRANE & SHOVEL CO.
608 S. Dearborn St., Chicago, Ill.

ORTON
Cranes, Shovels & Buckets

For Your Yard Work

Ask for Bulletin

CORDUROY CRANES **P&H**
Equipped with hook, bucket, clamshell or magnet, they can easily handle any kind of loose materials. Easily maneuvered on their Corduroy traction—no tracks required.
HARNISCHFEGER CORPORATION
Established 1884
3801 National Avenue, Milwaukee, Wis.

AMERICAN MONORAIL

An Overhead System of Material Handling
Let us show you how you can use it in your own plant
THE AMERICAN MONORAIL COMPANY
13104 Athens Ave. CLEVELAND, OHIO

Greater Hook Approach in all Directions!

Box "LHR" (low-head-room) Electric Traveling Crane gives full crane service in buildings where this has not been considered possible, owing to limited space.

And LHR operates in *less* space, giving greater "hook approach" in all directions than any other standard crane. Of all-steel arc-welded construction, LHR is ball bearing equipped throughout, and *standardized* for 1, 2 and 3 ton loads, spans up to 50 feet. Investigate LHR utility for *your* plant. *Write for Bulletins.*

Box makes the famous Type "C" Crane—also *standardized*—and *Box Load Lifter* Electric Hoists. Details at request.

Electric Traveling Cranes

Grab Bucket Operating Cranes

Hand-Operated Traveling Cranes

BOX CRANE & HOIST CORPORATION

E. Ontario and Janney Streets

PHILADELPHIA, PA.

Established 1878

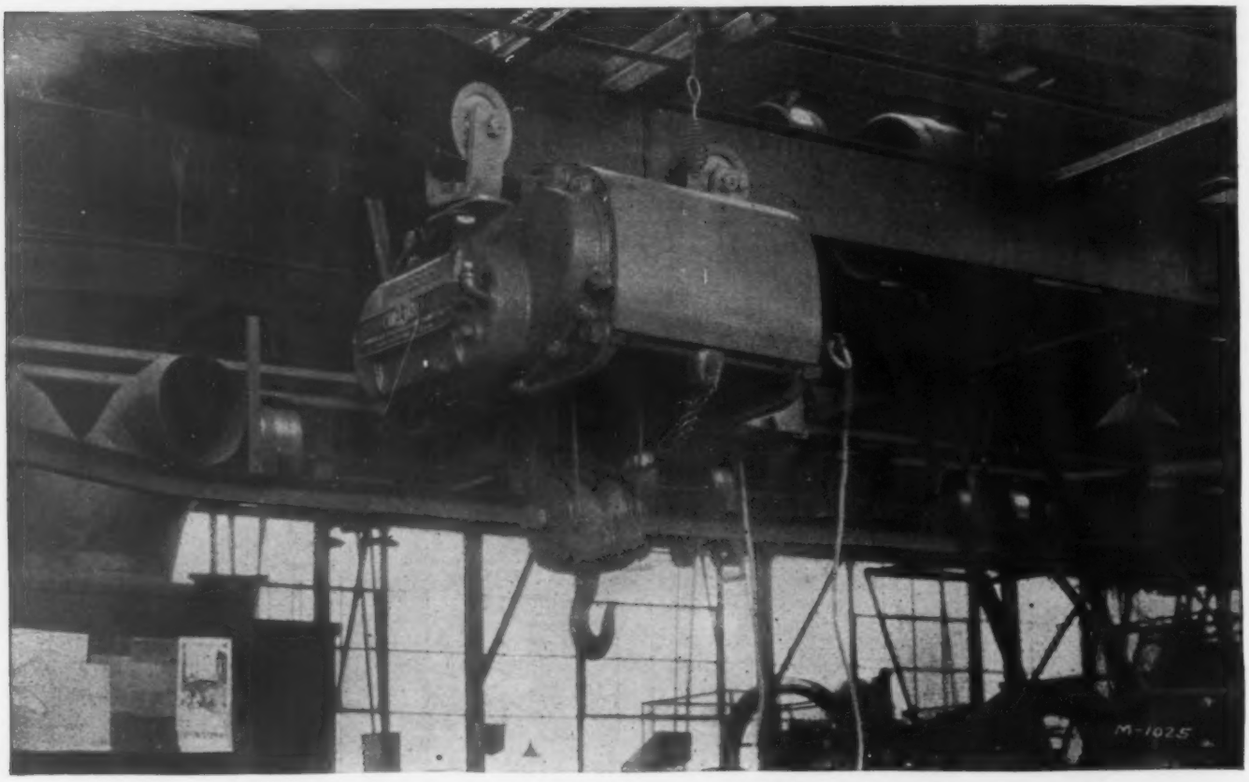
"One of the Pioneer Crane Builders"

Electric Hoists

Monorail Hoists

Jib Cranes

Special Cranes For Special Conditions



High above crowded shop floors the LO-HED HOIST provides a complete materials handling system

Taylor Stokers

A-E-CO Furnace Armor

Ash Hoppers

Marine Auxiliaries for Naval, Commercial and Pleasure Craft

LO-HED Monorail Hoists

Stationary Hoists

Juruick Refrigeration Units and Ammonia Compressors

Smoothly . . . powerfully . . . dependably, a LO-HED Electric Hoist picks up its load, lifts it almost to the ceiling, carries it over all obstructions, and lowers it accurately to its new position.

LO-HED Hoists lift and carry any kind of load, day in and day out, without adding to floor congestion. They operate on any standard track system, utilizing ceiling space that otherwise would be wasted and releasing valuable floor space for other uses. Because of its patented construction, the LO-HED operates in the absolute minimum headroom. This makes it possible to use a LO-HED anywhere in the plant, regardless of low ceilings.

LO-HED Hoists speed up work and increase production. They lift and carry heavy loads just as easily at quitting time as they do at the start of the day. Their muscles never tire.

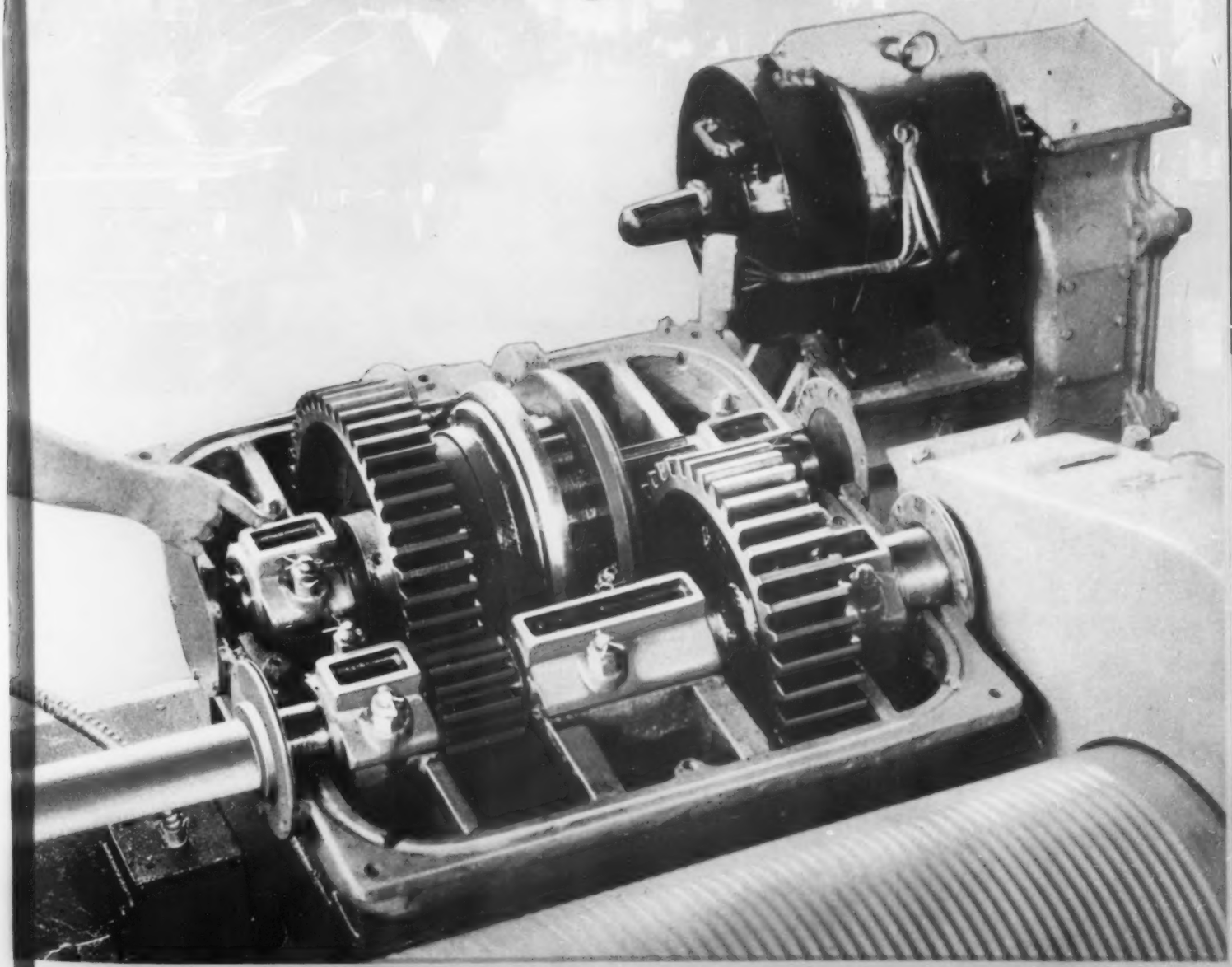
Capacities 500 to 24,000 lbs. Types for every industrial requirement.

WRITE FOR LITERATURE

AMERICAN ENGINEERING

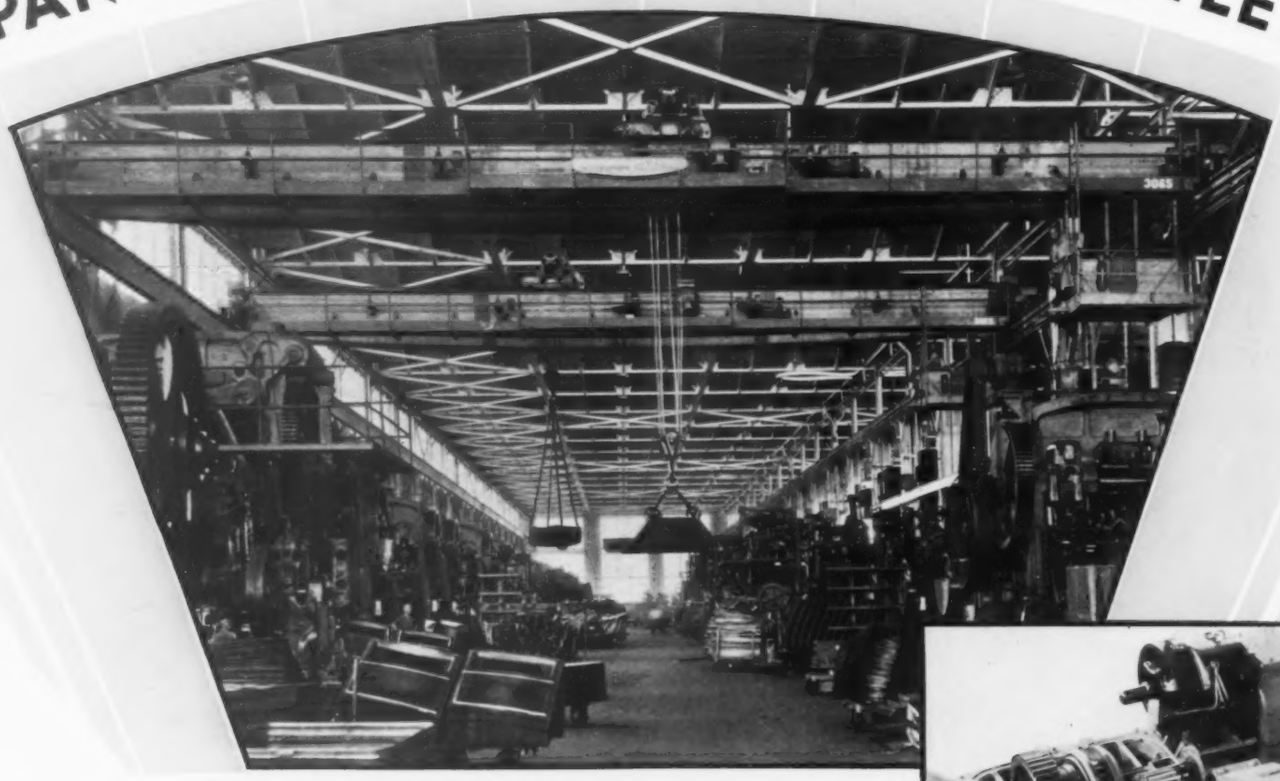
AMERICAN ENGINEERING COMPANY, 2410 ARAMINGO AVENUE, PHILADELPHIA

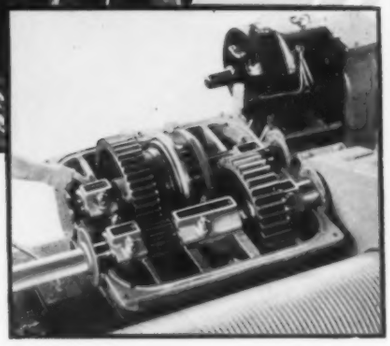
Here integral bearings, completely housed, provide *lasting alignment*



NILES CRANE
DIVISION

SPAN THE CRANE BAY WITH A NILES





. . . it has the compact reduction-gear and load-brake trolley

Judge a crane by its trolley—a trolley by its high speed reduction-gear design!

In a Niles, a casting houses these vital members and contains, as an integral part, the bearings that support the gears and load-brake. Rigid support and accurate alignment is permanent.

Proper lubrication to gears, load-brake and bearings is assured by the oil bath. The lubricant cannot leak out, nor can dust and dirt penetrate the tightly sealed housing. In a Niles Crane Trolley wear and the need for maintenance is reduced to a minimum.

So it is throughout every Niles, in Traveling Gantry and Wall Cranes alike. Every part has been detailed to provide the strength and stamina that gives long life and low cost load handling.

SHEPARD NILES CRANE AND HOIST CORPORATION
356 Schuyler Avenue - - - Montour Falls, N. Y.
Works: Montour Falls, N. Y. - - - - Philadelphia, Pa.

NILES CRANE DIVISION

Member EIMA

Ohio LIFTING MAGNETS
are long lived
All insulation is asbestos. They have maximum lifting capacity. Outer pole has no through holes; it does not loosen, wears slowly and seldom breaks.
THE OHIO ELEC. MFG. CO., 5908 Maurice Ave., Cleveland, O.

E&M LIFTING MAGNETS—BRAKES—COMPENSATORS—MANUAL & MAGNETIC CONTROLLERS—LIMIT STOPS—AUTOMATIC STARTERS
THE ELECTRIC CONTROLLER & MFG. CO.
2700 EAST 79TH ST. — CLEVELAND — OHIO

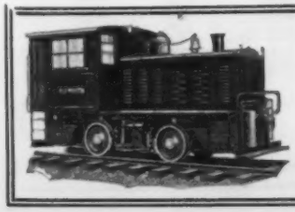
DETROIT HOISTS
ELECTRIC and PNEUMATIC
CAPACITIES ¼ to 10 TONS
DETROIT HOIST & MACHINE CO.

HANNA AIR HOISTS
Price is a small fraction of any other type of Power Hoist
HANNA ENGINEERING WORKS
1761 ELSTON AVE., CHICAGO, ILL.

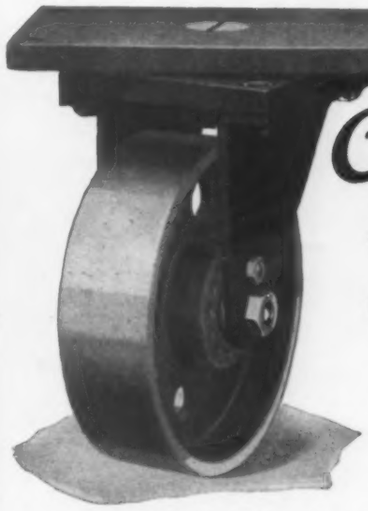
LOW HEADROOM
HAND AND ELECTRIC HOISTS AND CRANES *for every purpose. Write for catalogs.*
ROBBINS & MYERS, INC.
Hoist and Crane Division, Springfield, Ohio

A Complete Line of Overhead MATERIALS HANDLING EQUIPMENT
Reading Chain & Block Corporation
Reading, Pennsylvania
TRAVELING CRANES · TRANSFER CRANES · JIB CRANES
ELECTRIC HOISTS · MONORAIL SYSTEMS · CHAIN BLOCKS

TERRY STEEL DERRICKS and DERRICK FITTINGS
For General Construction and Material Handling Work
AMERICAN-TERRY-DERRICK CO.
SOUTH KEARNY, N. J.


PLYMOUTH
GASOLINE & DIESEL
LOCOMOTIVES
from 2 to 80 Tons
WRITE FOR PERFORMANCE BULLETINS
PLYMOUTH LOCOMOTIVE WORKS
PLYMOUTH, OHIO

BUILT TO LAST A LIFETIME

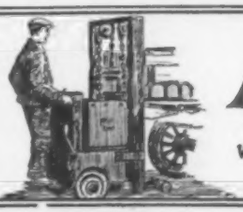

Colson Heavy Duty Casters
Write for copy of our complete Caster Catalog

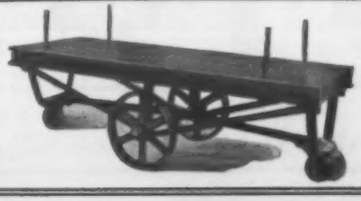
MODEL H-807-B, pictured above, is probably the strongest caster ever made. Practically indestructible, it is typical of the Colson Heavy Duty Caster Line, which is the consummation of more than 25 years' painstaking development. No. H-807-B is constructed of heavy steel, manufactured to precision. Every part is accurately machined and hardened to insure lifetime service.

THE COLSON COMPANY, Elyria, Ohio
Branches in Principal Cities

EASTON CARS
FOR EVERY INDUSTRIAL PURPOSE
TRACK SWITCHES
EASTON CAR & CONSTRUCTION CO.
EASTON, PA.

LEWIS-SHEPARD COMPANY
122 WALNUT STREET, WATERTOWN STATION, BOSTON, MASS.
STACKERS JACKLIFTS FOOTLIFTS SKIDS RACKS


The WRIGHT TRUCK
for efficiency in transportation
WRIGHT-HIBBARD INDUSTRIAL ELECTRIC TRUCK CO., Inc.
Phelps New York


Trucks and Trailers Industrial Cars
The Chase Fdy. & Mfg. Co.
Columbus, Ohio

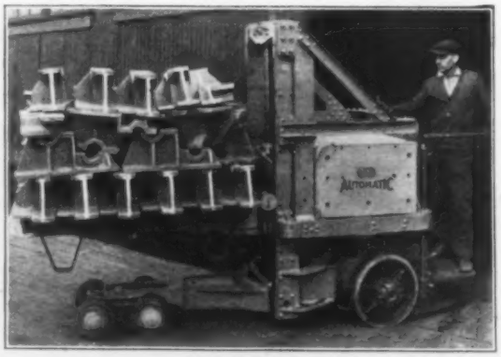
WHICH TRUCK FOR THE JOB?

YOU don't have to "go it blind" in fitting an "Automatic" truck to your particular job. "Automatic" maintains a nationwide group of material handling specialists whose experience is at your service.

It's their business to sell by saving. There is an "Automatic" model to solve every intra-plant transportation and material handling problem.

Above: Showing some of the many standard and specially equipped Automatic Trucks which make it possible for us to say, "There is an 'Automatic' model to solve every intra plant transportation and material handling problem."

Below: An "Automatic" Tiering-Lifting Truck equipped with "Automatic" 4 wheel equalized, compensating front axle.



Tell us your material handling problems and we will suggest an economical answer.

AUTOMATIC
TRANSPORTATION CO., INC.,
2943 Main St., Buffalo, N. Y.

"AUTOMATIC"
models include—

LOAD CARRYING
LOW LIFTING
TIERING LIFTING
DIE HANDLING
REEL TRUCKS
BOSH TRUCKS
CRANE TRUCKS
BAGGAGE TRUCKS
FORK TRUCKS
RAM TRUCKS
DUMP HOPPERS
TRACTORS
LOCOMOTIVES

AUTOMATIC

Affiliated with Barrett-Cravens Co., Chicago, Manufacturers of Hand-Lift Trucks, Lift-Truck Platforms, Portable Elevators, Structual Steel Storage Racks and Barrel Trucks; also Walker Vehicle Co., Chicago, Manufacturers of Electric Street Trucks and Tractors.

READY POWER

keeps Industrial Trucks

ACTIVE

READY-POWER generates power *as used* in ample quantities to meet the heaviest demands of the *most active* electric industrial trucks.

Active trucks are *earning* trucks! Industrial trucks operating below their starting capacity are not earning their board.

Ready-Power equipped trucks *are* active trucks. Give them your hardest jobs! Long hauls, steep ramps, heavy loads, mean nothing to Ready-Power. An electric generator driven by a 4-cylinder gasoline engine continuously operates the truck at its *starting speed!*

Ready-Power equipped trucks perform the hardest operations and end the day as *active* as they started. Get the *facts* on Ready-Power! Learn why Ready-Power equipped electric trucks are the most practical material handling tools in use. The coupon below will bring full details and installations. *Mail it today!*

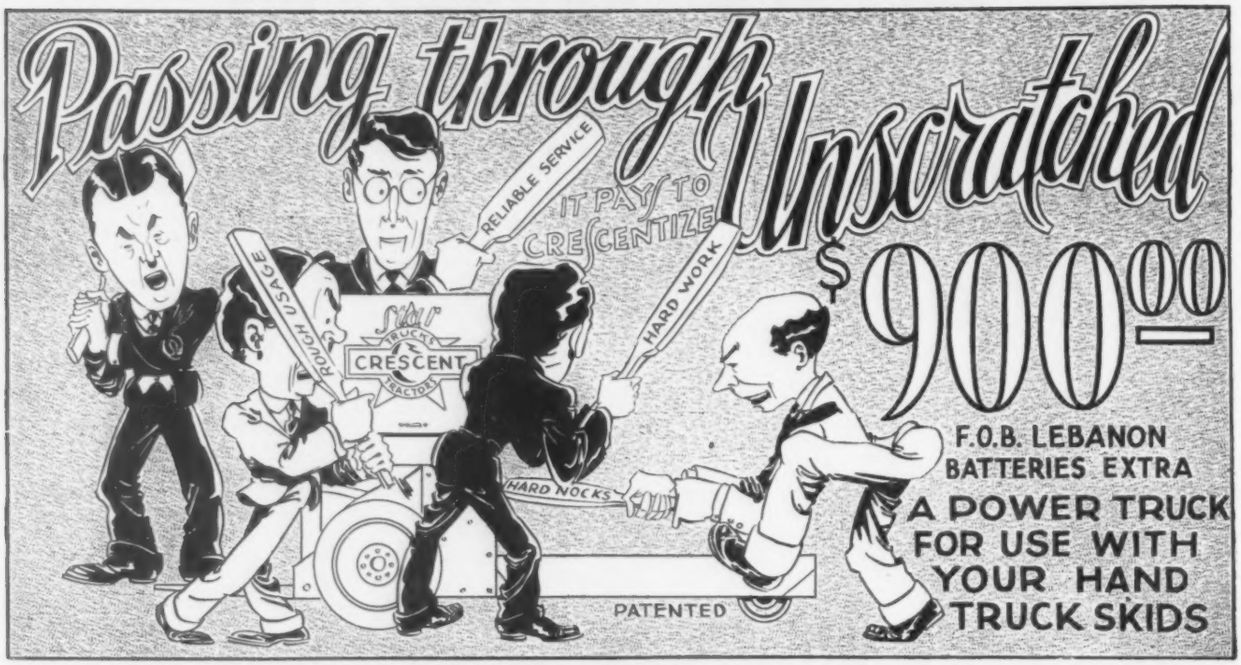
The READY-POWER *Company*
3822 Grand River Avenue, Detroit, Mich.

READY-POWER
GASOLINE ELECTRIC
for ELECTRIC INDUSTRIAL TRUCKS

THE READY-POWER CO.,
3822 Grand River Ave.,
Detroit, Michigan.

Please mail us at once, a copy of the new book: Truck Power Every Hour.

Name .....
Company .....
Address .....



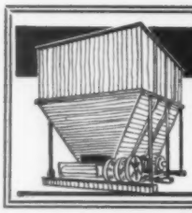
CRESCENT TRUCK CO. Lebanon, Pa.

16 Years of Experience Building All Types of Electric Industrial Trucks, Trailers and Tractors

Molding Machines
for production and jobbing castings
Wm. H. Nicholls Co., Inc.
91st Ave. & 126th St., Richmond Hill, N. Y.

CAPE MAY SAND CO.
CAPE MAY CITY, N.J.
Assure Yourself Of Uniformly High Quality By Specifying Cape May Sand
THE IDEAL HIGH-SILICA SAND BLAST SAND CORE SAND and FURNACE BOTTOM
CAPE MAY SAND COMPANY
512 WASHINGTON ST. CAPE MAY CITY, N.J.

HERMAN
Jarr Independent Rollover and Pattern Drawing
MOLDING MACHINES
Send us your inquiry and our Service Department will gladly advise with you on your requirements.
Herman Pneumatic Machine Co. General Offices Union Bank Bldg., Pittsburg, Pa.



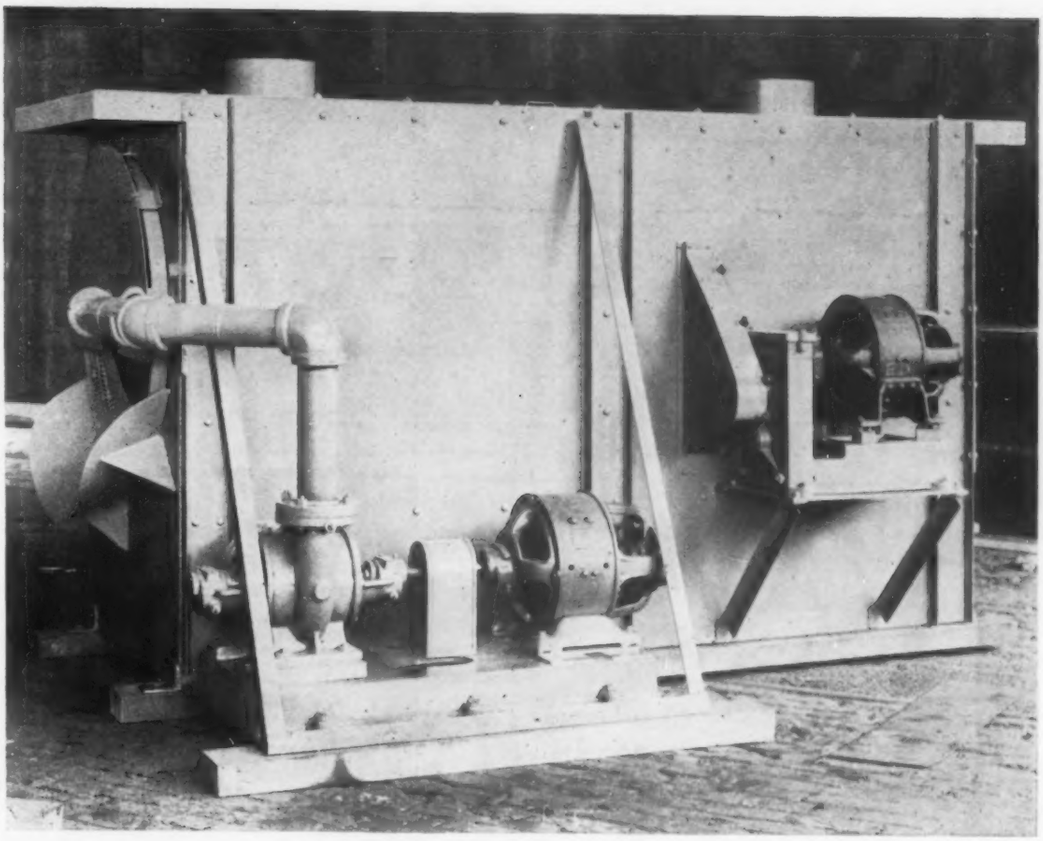
SAND HOPPERS!
BANDP Sand Hoppers are ideal storage units for molding systems. Write for catalog of complete sand and mold handling systems.
The Beardsley & Piper Company
2541 North Keeler Avenue, Chicago

FOUNDRY MOLDING MACHINES
MODERN STANDARD SPECIAL
POURING DEVICES LIGHT CRANES
ARCADE MANUFACTURING CO.
FREEPORT, ILL., U. S. A.

ROTARY POSITIVE
Blowers
Gas Pumps
Meters
Liquid Pumps

THE CONNERSVILLE BLOWER CO. INC.
WILBRAHAM-GREEN BLOWER CO.
THE P. H. & F. M. ROOTS CO.
Comprising
THE STACEY ENGINEERING CO.
[Blower Division]
Mount & Kentucky Aves.
20 North Wacker Drive, Chicago, Illinois
Connersville, Indiana
New York City 420 Lexington Avenue

Vacuum Pumps
Acme Blowers
Victor Blowers
Acme Gas Pumps
Victor Gas Pumps



Reducing labor cost 100%

on a metal cleaning operation

IDEAL
TRADE MARK REG. U.S. PAT. OFF.

Engineering Service

Problems of removing scale, chips and fins from castings and forgings—of scrubbing, rinsing and drying stamped and drawn parts, removing grease, oil and chemicals—are special problems. Our Engineering Service involves a study of your particular problem and the application of automatic equipment to solve it *at a considerable saving in labor.* Our engineers will gladly examine your situation—asking them to do so will incur no obligation.

In one of the world's largest automotive plants, bearing assemblies of the flexible spiral roller type were hand-dipped in two soap solutions and one bath of kerosene to give them adequate cleansing. Slow—laborious—costly.

Our engineers adapted a standard IDEAL unit to the job and eliminated *all* the labor on the operation.

Now the roller bearing assemblies enter a rotary drum and are deposited—not dropped—on the floor of the drum. The parts are never dropped. A spiral works them through the drum with slight agitation.

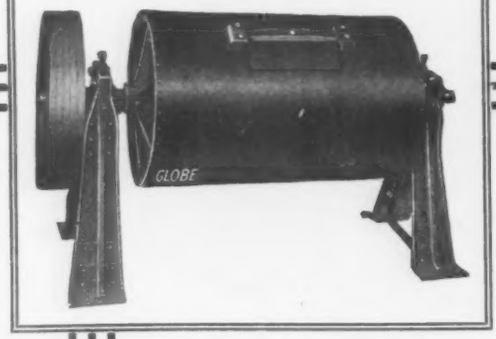
In the first part of the drum, which is solid, the bearings are soaked in Oleum spirits. In the second part, which is perforated, they are subjected to the play of jets of Oleum under pressure. They emerge from the drum thoroughly clean, onto a conveyor. The IDEAL machine is simply a part of the moving assembly—all cleaning labor has been eliminated.

Pans under the drum catch grit and chips. Spirits are circulated by a centrifugal pump. Pan is fitted with steam coil which functions when hot cleaning compound is used.

Put it up to Specialists

N. Ransohoff Incorporated

West 71st Street at Millcreek, Carthage, Cincinnati, Ohio



PAY *by Saving!*

OFT TIMES, just the elimination of one hand operation will soon pay for a Globe Tumbling Barrel.

Skilled labor operating a grinding or polishing wheel is costly and slow. Articles polished by hand can be finished hundreds and thousands at a time in Globe Tumbling Barrels.

The operation is simple. Skilled labor is not needed. The simplicity, speed and low production costs effect sharp economies. You pay for the barrel through the time and money they save.

Send us a few parts you are now finishing by hand, let our experimental department determine whether they lend themselves to "barrel finishing." There's no obligation involved.

The Globe Machine & Stamping Co.
1250 W. 76th St., Cleveland, Ohio

GLOBE TUMBLING BARRELS
GOOD BARRELS SINCE 1904

SIMPSON
INTENSIVE SAND MIXERS
SAND HANDLING AND PREPARING
EQUIPMENT FOR THE FOUNDRY
NATIONAL ENGINEERING CO.
549 W. WASHINGTON BLVD. CHICAGO, ILL.

PANGBORN
SAND BLASTS AND DUST COLLECTORS
For every industrial requirement
Pangborn Corporation - - - Hagerstown, Md.

SLYBLAST
for Sandblast · Shotblast · Gritblast
Sandblast · Tumbling Mills · Complete Installations with Dust Arresters
THE W·W·SLY MANUFACTURING COMPANY
CLEVELAND OHIO
OFFICES IN ALL PRINCIPAL CITIES

MOTT
SAND-BLAST MFG. CO. INC.
Sand Blast Machines and Allied Equipment
GENERAL OFFICE AND WORKS:
4611-4621 Flournoy Street Chicago, Ill.

Reclaim every bit of valuable iron from foundry refuse *mechanically* with a High Duty Magnetic Separator. Three separations—iron, sand and slag—without hand labor. Saves 75c. to $1.20 on every ton refuse; pays for itself. Write for bulletin.
MAGNETIC MFG. CO.
225-24th Ave., Milwaukee, Wis.
HIGH DUTY MAGNETIC SEPARATORS

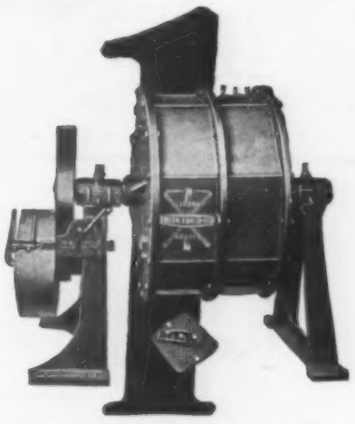
THE IRON YOU SAVE
more than pays the cost
Let us send you details
Dings Magnetic Separation
DINGS MAGNETIC SEPARATOR CO.
MILWAUKEE, WISCONSIN

Crucibles
ROSS-TACONY CRUCIBLE CO.
TACONY
PHILADELPHIA, PA.
Stopper Heads
ESTABLISHED 1871

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO.
ROD MILLS ~ DRAW BENCHES ~
WIRE DRAWING AND HANDLING EQUIPMENT.
FOR STEEL, COPPER AND ALLOYS.

ABBOTT

hand or finishers



Figures Which Mean a Profit to Users of the Abbott Ball Burnishing Process

Hundreds and often thousands of small metal stampings, castings or forgings can be finished at a time, with a minimum of hand labor; and whether a large or small production is involved the advantages are the same—good results, low cost. ¶ Why not investigate? Send in samples of your work for experimental treatment. No obligation.

THE ABBOTT BALL COMPANY

"Originators of Commercial Ball Burnishing"

1047 New Britain Avenue, Hartford, Conn.

TAYLOR-WILSON MFG. CO

ENGINEERS - FOUNDERS - MACHINISTS

TUBE MILL EQUIPMENT

FOR THE MANUFACTURE OF SEAMLESS LAPWELD, AND BUTTWELD TUBING

GREY IRON AND SEMI-STEEL CASTINGS
MACHINE MOULDED GEARS
AND MACHINE WORK

OFFICE AND WORKS: McKEES ROCKS, PA.
(PITTSBURGH DISTRICT)

Hyde Park Foundry and Machine Co.

HYDE PARK (on West Penn. Div. P. R. R.), Pa.

Builds ROLLING MILL, STEEL WORKS and TIN PLATE MACHINERY

Rolls Sand Chilled IRON CASTINGS ROLL LATHES

Our equipment is first class and our organization composed of practical men. We would like to submit prices on any work in our line, either large or small. Correspondence invited.

Prompt shipment from large and well seasoned stock.
When in need order OUR Crucibles.
They give satisfaction.

McCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.

UNITED

ENGINEERING and FOUNDRY COMPANY
PITTSBURGH, PENNSYLVANIA
THE WORLD'S LARGEST MAKER OF ROLLS and ROLLING MILL EQUIPMENT

NATIONAL

Plain and Special
Alloy Chilled Rolls

Why Experiment

Use the Best

Rolling Mill Machinery Comprising

WEIGHT—RIGIDITY—WORKMANSHIP

NATIONAL ROLL & FOUNDRY CO.
AVONMORE, PA. U.S.A.

BLISS

ROLLING MILL EQUIPMENT
FOR
HOT OR COLD ROLLING

MILLS

MILL REELS

COILERS

SLITTERS

WINDING REELS

LEVELING MACHINES

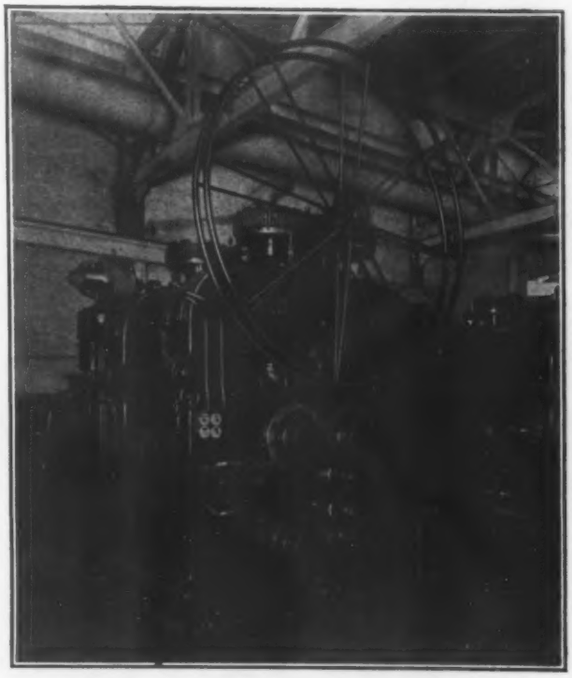
SHEARS

RECOILING MACHINES

SCRAP-BAILING MACHINES

ETC.

ETC.



BLISS CLUSTER MILLS
ROLLER-BEARING EQUIPPED

These mills are built in capacities ranging from 4″ to 72″ wide for hot or cold rolling.

Full details on request.

BLISS for MACHINERY

E. W. BLISS CO., BROOKLYN, N. Y., U. S. A.

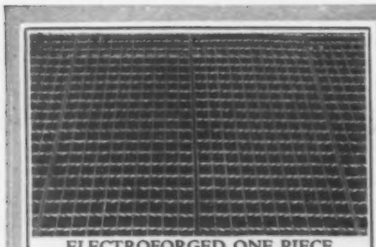
Factories: BROOKLYN, N. Y. HASTINGS, MICH. SALEM, OHIO

Sales Offices: DETROIT CLEVELAND CHICAGO ROCHESTER PHILADELPHIA CINCINNATI NEW HAVEN BOSTON

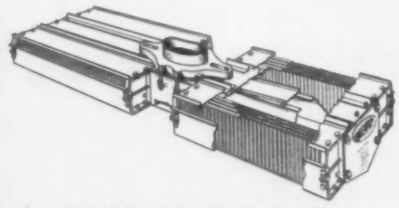
Foreign Factories and Offices: LONDON, Eng. TURIN, Italy PARIS, France

BLISS

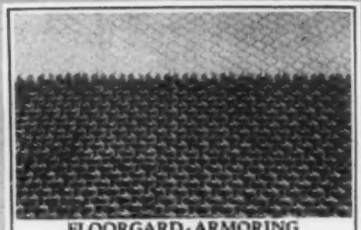
No. 577



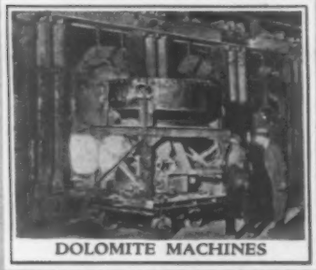
ELECTROFORGED ONE PIECE STEEL GRATING



TRACYFIER (Steam Purifier)



FLOORGARD-ARMORING FOR CONCRETE FLOORS

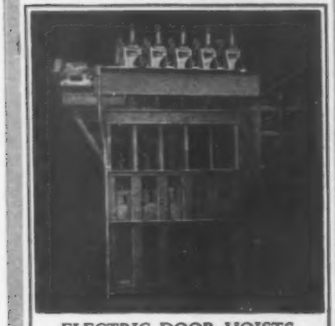


DOLOMITE MACHINES

TRADE MARK REG. U.S. PAT. OFFICE

BLAW-KNOX

STANDARD STEEL BUILDINGS



ELECTRIC DOOR HOISTS

BLAW-KNOX Products Reduce Plant Maintenance, Cut Production Costs and Increase Output

Completely descriptive literature on any Blaw-Knox Product will be sent on request. Write to our nearest District Office.

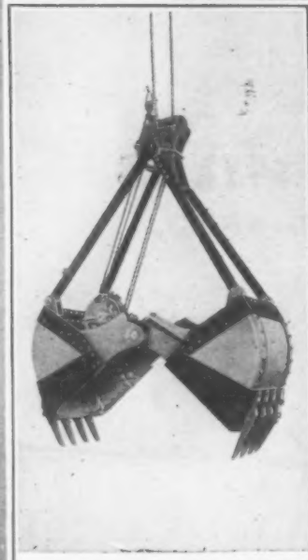
BLAW-KNOX COMPANY
2007 Farmers Bank Bldg., Pittsburgh, Pa.

New York	Philadelphia	Cleveland
Chicago	Birmingham	Detroit
Boston	Buffalo	Baltimore

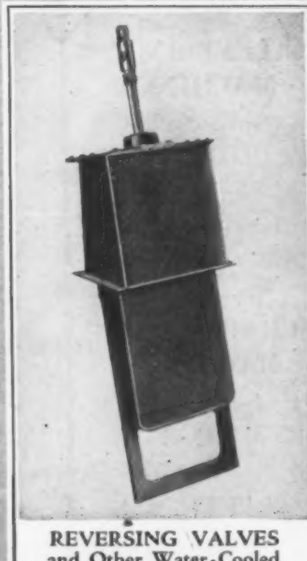
Export Division:
Blaw-Knox International Corporation,
Canadian Pacific Bldg., New York

London, England, New Oxford House, Hart St., Holborn, W. C. 1.—Paris, France, 1 Rue de Clichy—Milano, Italy, 6, via S. Agnese, 6—Dusseldorf, Germany, 17 Bismarckstrasse

REGENERATIVE AIR PREHEATERS

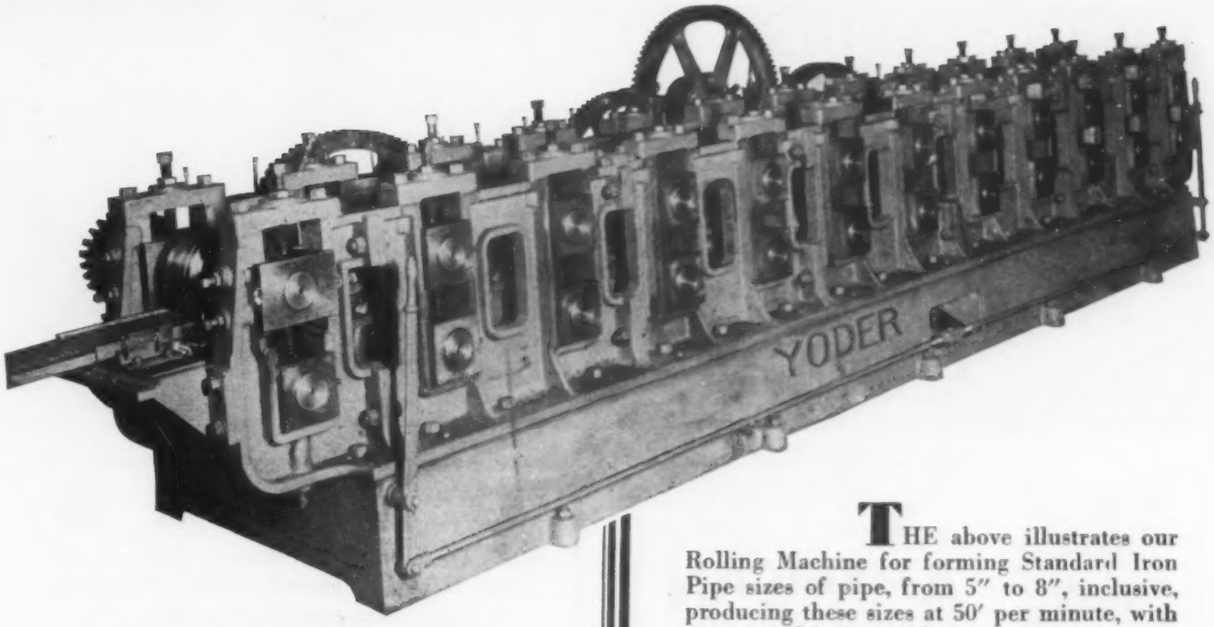


CLAMSHELL BUCKETS with Ball-Bearing Sheaves



REVERSING VALVES and Other Water-Cooled Equipment for the Steel Industry

BLAW-KNOX

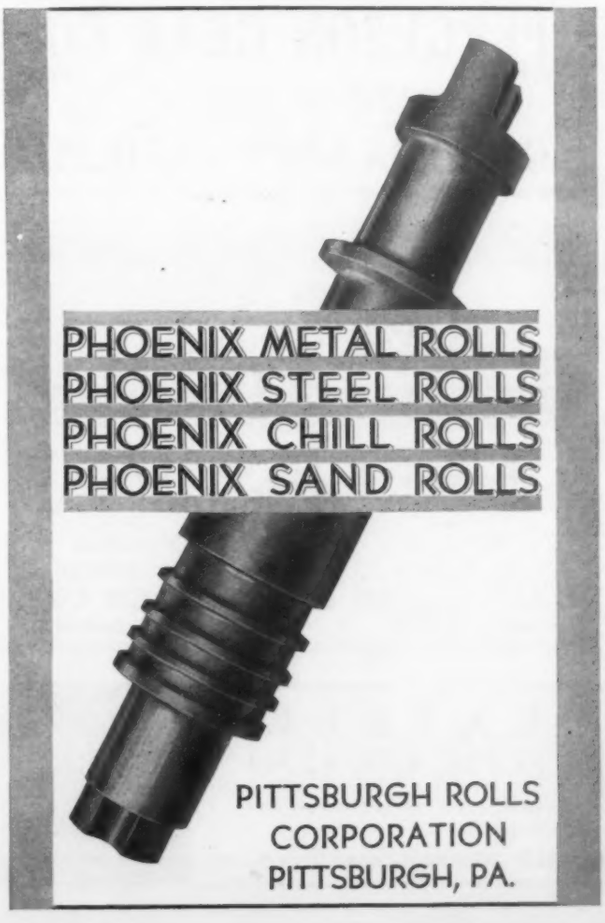


YODER H-1270 PIPE FORMING MACHINE

THE above illustrates our Rolling Machine for forming Standard Iron Pipe sizes of pipe, from 5″ to 8″, inclusive, producing these sizes at 50′ per minute, with seam suitable for welding.

We also build smaller machines for sizes down to ⅜″ O.D. and larger machines for sizes up to and including 24″ x ½″ wall. If interested in the production of *pipe* or *tubing* write us by all means.

THE YODER COMPANY
Walworth Ave. at W. 58th St.
Cleveland, Ohio



PITTSBURGH ROLLS CORPORATION
PITTSBURGH, PA.

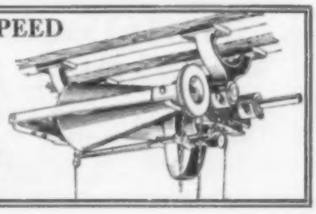
UNION STEEL CASTING CO.
PITTSBURGH, PA.
ANNEALING BOXES & BOTTOMS
ACID OPEN HEARTH
STEEL CASTINGS

EVANS VARIABLE SPEED COUNTERSHAFT . . .

Provides a 6 to 1 speed variation, with clutch; Can be stopped and started at any speed; Speed can be changed without stopping.

Catalog on Request

Evans Friction Cone Co.
Newton Highlands, Mass.
A. Warden & Co., 48 Shepherdess Walk, City Road, London, E. C., England



A BULLDOG GRIP

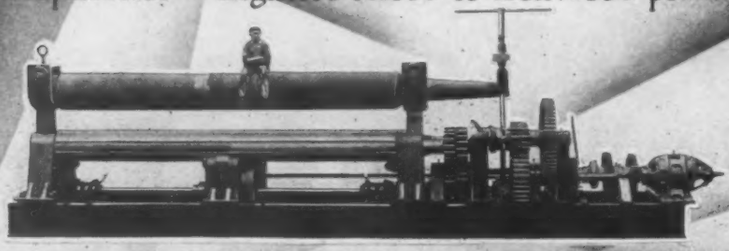
The asbestos-lined flexible band of a Caldwell Clutch seizes the friction ring with a bulldog grip and *holds* on until released by a slight tug at the operating lever. In addition to dependable performance a Caldwell Friction Clutch gives assurance of minimum clutch trouble because one screw adjusts it.

Send for Catalog
W. E. Caldwell Co.
Incorporated
200 E. Brandeis St., Louisville, Ky.

Caldwell FRICTION CLUTCHES

POOLE QUALITY
Flexible Couplings
Reduction Gears
Cast Gears
Special Machinery
POOLE ENGINEERING & MACHINE CO.
BALTIMORE, MARYLAND

PLATE BENDING ROLLS
Capacities ~ Lightest sheet to heaviest plate



Our Line
Light and heavy machinery for all classes of sheet metal, plate and structural work

BERTSCH & COMPANY
Cambridge City Indiana

American Pulleys and Hangers
will keep your plant running smoothly. Write for descriptive literature, list of dealers and catalog.
THE AMERICAN PULLEY COMPANY
4200 Wissahickon Ave., Philadelphia, Pa.
AMERICAN
PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS

GEARS
Spur - Helical - Bevel - Worms - Screws - Racks
Gear Hobbing - Thread Milling - Broaching
THE ADAMS COMPANY (Est. 1883)
1900 Iron St., Dubuque, Iowa

TEST SPECIAL RUBBER BELTING
Lowers your Belting cost by giving the best results for a reasonable expenditure
WATERPROOF FLEXIBLE STRONG
Write for Belt Engineering Booklet
NEW YORK BELTING & PACKING CO.
NEW YORK-CHICAGO-PHILADELPHIA-PITTSBURGH-BOSTON-ST. LOUIS-SAN FRANCISCO

GRANT GEAR WORKS
Prompt Attention
both to special work and to orders from our Complete Stock of
Spurs Worm Gears
Bevels Reduction Units
Second & B Sts., Boston, Mass.

FOR INCREASED PRODUCTION
"WHITNEY"
SILENT CHAIN DRIVES
POSITIVE FLEXIBLE DURABLE
THE WHITNEY MFG. CO. Hartford, Conn.

FERGUSON GEAR CO.
OUT GEARS CHAIN DRIVES
BEVEL SPUR SPIRAL WORM SPROCKETS
RAWHIDE, BAKELITE AND HARDENED STEEL PINIONS
Member American Gear Manufacturers Association
GASTONIA, NORTH CAROLINA

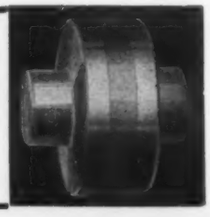
TESTED CHAINS ONLY
BRADLEE & CO., Inc.
1615 N. Delaware Ave., PHILADELPHIA, PA.
Sole Manufacturers of D.B.G. Special Crane Chain
Hand Made Iron Chain—Ship Cable, Marine Railway Crane, Dredging and Slings

GEARS - WORMS - CAMS - MADE TO ORDER
HARTFORD GEARS
THE HARTFORD SPECIAL MACHINERY CO., Hartford, Conn.

SPROCKETS
Complete Stock for Immediate Delivery
Our stock of gears and sprockets is complete in every way. Send us your order or inquiry for any size.
DUNDORE MANUFACTURING CO.
244 Orange St. Reading, Pa.

Magnetic Controllers
Brakes Resistors
Manual Controllers
Flexible Couplings
THE CLARK CONTROLLER CO.
1146 E. 152d St. CLEVELAND, O.

J Jones FLEXIBLE COUPLINGS
Spur and Worm Gear Speed Reducers, industrial gears, semi-steel pulleys
WRITE FOR GENERAL CATALOGUE
W. A. JONES FOUNDRY & MACHINE CO., 4434 W. Roosevelt Road, Chicago, Ill.



A New Leather Belting that will effect a 20% to 25% Saving for Belt Users

IN ANNOUNCING the *new* Graton & Knight Leather Belting we believe we are understating rather than overstating the facts when we say that it will effect at least a 20% to 25% saving for belt users.

This *new* belting is the result of 5 years of research and extensive field operation. During this time it has been tested in actual use under all kinds of operating conditions in all industries where leather belting is used. We frankly and sincerely believe this is the greatest development in the Leather Belting industry in over 50 years.

The big saving in maintenance, operating and production costs effected by the use of this new belting is due to its greater and more uniform adhesion in laps and plies, its unusual flexibility and waterproof qualities. It is made by a process of tension cementing that is wholly new and for which a unique type of belt making machinery (patent applied for) was developed by our own engineers.

With all its improvements it costs you no more than you formerly paid for our common cemented belting. Our new and unique belt making machinery has made this possible.

All belting users are invited to visit our plant at Worcester, Mass., and see in operation this amazing new type of belt making machinery which is producing this new leather belting that saves belt users 20% to 25%.

Frank K. Hallowell
President

Graton & Knight Company

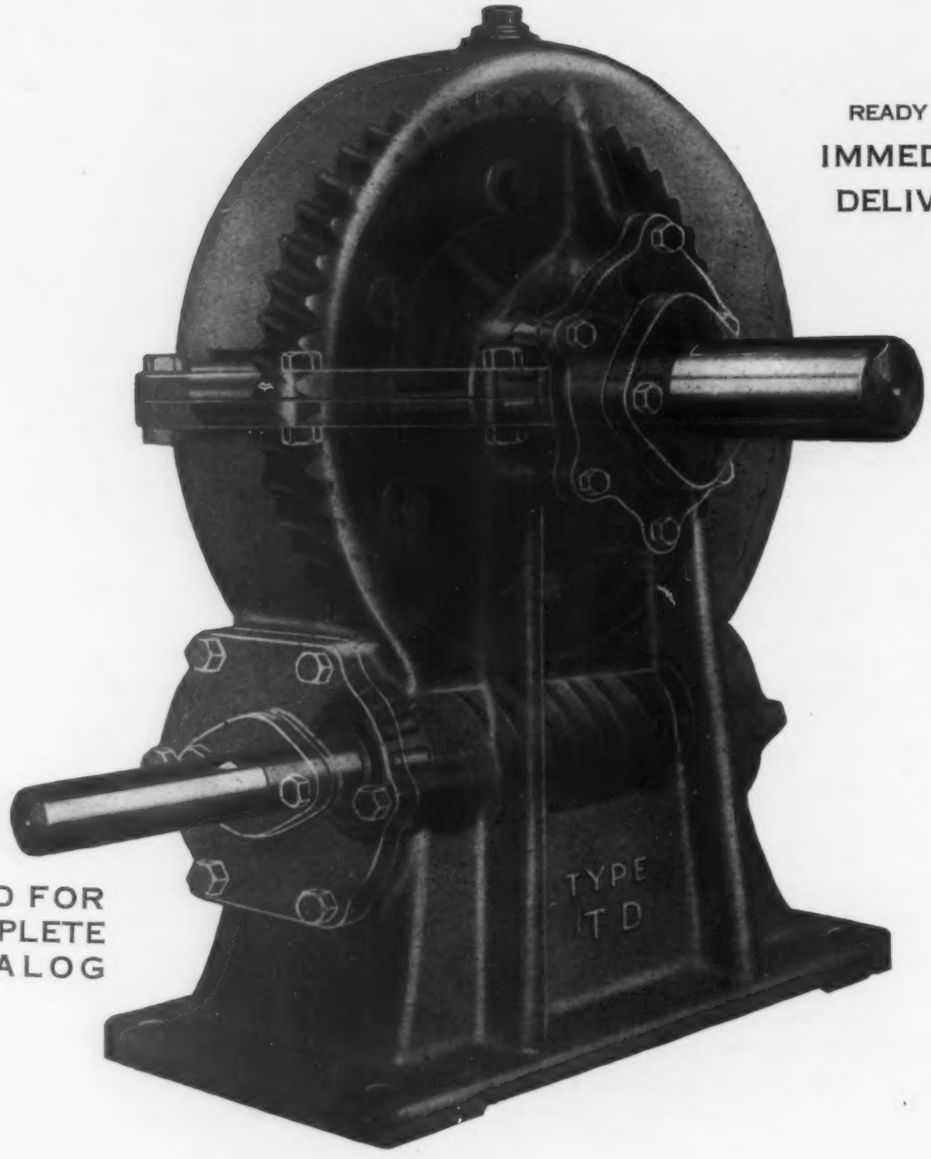
Worcester, Mass.

GRATON AND KNIGHT

LONG SERVICE

GOES WITH ALL **BOSTON GEAR** PRODUCTS

READY FOR
IMMEDIATE
DELIVERY



SEND FOR
COMPLETE
CATALOG

BOSTON GEAR WORKS SALES CO.

MAIN OFFICE AND FACTORY, NORTH QUINCY, MASS.

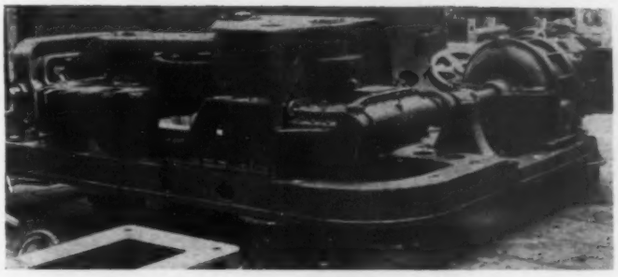
BRANCHES AT

BOSTON NEW YORK PHILADELPHIA CLEVELAND CHICAGO

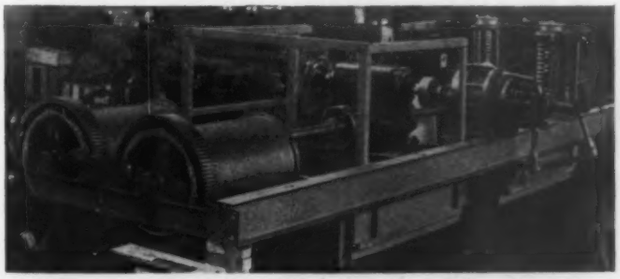
BOSTON GEARS

Built to construct and house the Navy's two Super-Zeppelins, this building measures 1175 feet in length, 211 feet in height and 325 feet in width. Its floor area of 364,000 square feet is the largest uninterrupted floor area yet built.

Horsburgh & Scott Speed Reducers Serve the World's Greatest Air Dock and Zeppelin Factory



Four sets of Horsburgh & Scott Worms and Gears are used to open and close the doors of the Zeppelin Air Dock. The non-reversible feature of the worm gear locks the door in any position against movement by air currents.



Cleveland Crane & Engineering Co.'s electric crane equipped with Horsburgh & Scott Worm-Gear Speed Reducer. This crane will do the lifting and carrying required for the construction of the ZRS-4 and ZRS-5.

HUGE in area — enormous in weight — the mastodon orange-peel doors of the new Goodyear-Zeppelin Air-Dock presented many problems.

Not the least of these was the means of drive. For this important task Horsburgh & Scott Worm-Gear Speed Reducers were selected.

The cranes that lift and carry the parts to build new Zeppelins are driven through these same dependable Speed Reducers.

Although the equipment of this building was supplied by three concerns . . . Wellman Engineering Co., Cleveland Crane & Engineering Co. and The Euclid Crane & Hoist Co. . . . they all selected H. & S. Worm-Gear Speed Reducers.

All through industry we have supplied Speed Reducers that save space . . . economize on power . . . eliminate dangerous gears and belting . . . and insure other worthwhile benefits.

The skill and experience of our engineers is at your disposal in planning new drives for your machines. Your request for our suggestions implies no obligation.

(Write for complete Speed Reducer Catalog)

THE HORSBURGH & SCOTT CO.

CLEVELAND, U. S. A.

SPEED REDUCERS AND GEARS

Glass by "Safetee-"

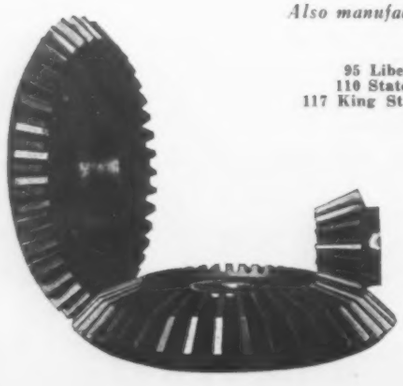
"Safetee" Glass is that shatter-proof kind they put in automobiles so they (the automobiles) can be wrapped around telegraph poles. You can burst the glass, but it can't cut you up. The Safetee Glass Co. is another of the many users of Earle Gears. Because high grade gears are needed promptly and Earle delivers the goods in a hurry at prices that are right and fair this concern marks orders "Gears by Earle." You will find it profitable to so mark your orders. Want us to prove it?

THE EARLE GEAR & MACHINE CO.

4721 Stenton Ave. Philadelphia, Pa.

Also manufacturers of Bridge Operating Machinery and "Lea-Simplex" Cold Metal Saws.

95 Liberty St., New York
110 State St., Boston, Mass.
117 King St., Melbourne, Australia
26 Charles St., London, Eng.
c/o Andrews & George Co.,
No. 5 Shiba Park, Tokyo, Japan



GEARS BY EARLE

Falk Heavy Duty Units have been standard among leading companies for more than twenty years. Available in the largest practical capacities according to any special design and for any speed reduction requirement.

Efficient — Under all Conditions and Loads

Many Types and Sizes

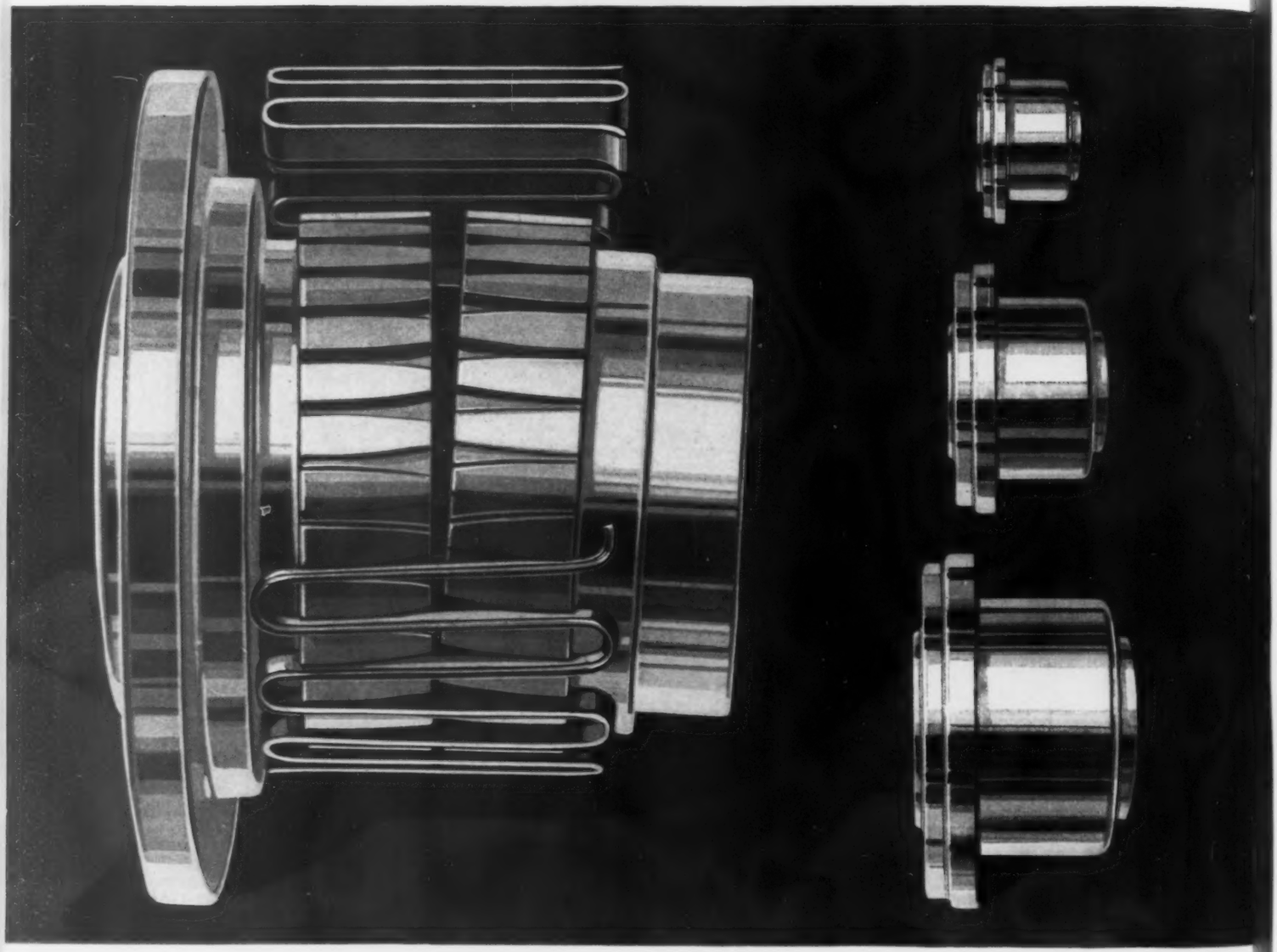
The Herringbone Gears around which Falk Heavy Duty and Marine Units are built are available in continuous and staggered tooth types, in diameters from one inch to sixteen feet, in any face width from one inch to six feet, with any pitch from 25 D. P. to ¾ D. P. . . . They are practical for speeds up to 16,000 feet per minute and are highly efficient under continuous full load service.

Falk Heavy Units are custom-built to handle heavy loads with high mechanical efficiency . . . They are fully equipped with Falk Herringbone Gears manufactured under complete Falk control—in Falk plants — by Falk patented processes. Each part is precision-made to insure the quiet, vibrationless dependable operation that has made Falk a good name in industry! . . . Because of this built-in quality, Falk Units handle tremendous loads under the most severe operating conditions without strain or wear, and with low operating costs. Their dependability and durability have made them the choice of industry for more than twenty years . . . No matter what your requirements are it will pay you to consult Falk first!

FALK

GEAR UNITS

FALK



FLEXIBLE COUPLINGS

Strong and Resilient – for Steady Power Delivery

Falk Flexible Couplings — all-steel — are scientifically constructed to transmit power without stress or strain . . . Because of their spring and groove construction, they permit a greater degree of lateral and torsional resiliency than any other coupling — compensating for angular and parallel misalignment . . . These two features assure smoother, more dependable operation and longer coupling life . . .

Falk Flexible Couplings provide widest distribution of pressure, allow most correct lubrication, float freely under load, give greatest resistance to overloads, absorb shock and vibration, operate equally well in either direction, either end can be the driver . . . Falk Flexible Couplings can be furnished from stock in capacities from 1/5 to 18,000 H. P. For special requirements up to 26,000 H. P.

THE FALK CORPORATION, Milwaukee— NEW YORK ALBANY ROCHESTER BUFFALO BOSTON WILKES-BARRE
PITTSBURGH YOUNGSTOWN CLEVELAND AKRON DETROIT NEWAYGO KALAMAZOO CHICAGO MINNEAPOLIS ST. LOUIS
BIRMINGHAM HOUSTON EL PASO DENVER SALT LAKE CITY SEATTLE LOS ANGELES SAN FRANCISCO

Canada: THE WILLIAM KENNEDY & SONS, LTD., Owen Sound, Ontario.
Branches: HALIFAX MONTREAL TORONTO COBALT WINNIPEG VANCOUVER

IXL GEARS

For Every Need

From gears weighing tons apiece for large bridge jobs, to the smallest gears made. We make them all!

Tens of thousands of patterns on hand help to meet your special requirements with more speed and less cost.

Send for "Gear Problems"—a 661-page Reference Book which covers all types of gears, speed-reducers, racks, etc.

Established 1859

FOOTE BROS.
GEAR & MACHINE CO.
111 N. CANAL ST. CHICAGO, ILL.

Sales and Engineering Offices in all Principal Cities, U. S. A. and Canada

I. A. 316

FOOTE
BROS.
GEAR &
MACHINE CO.
Dept. 33
111 N. Canal St.
CHICAGO, ILL.

Please send me copy of "Gear Problems."

Signed _____

Address _____

7-30

"PENMAID"

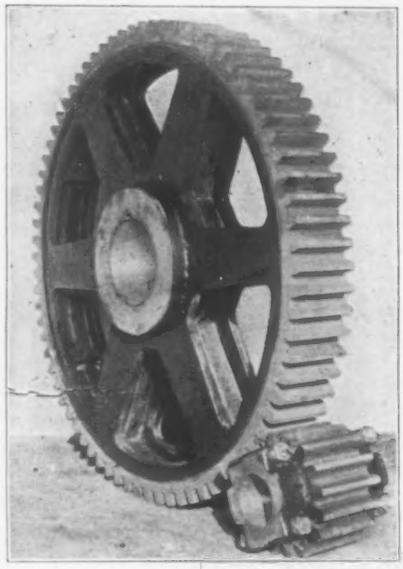
Guaranteed against defective material and workmanship.

GEARS. . any Material or Style

One gear may tie up production or cause untimely delays unless you are able to get a quick delivery on just the gear you need—and that is where we come in with satisfactory workmanship and service. Spur, worm, bevel, mitre, or any special style in any material. Tell us your requirements.

PENNSYLVANIA GEAR & MACHINE CO., Inc.
2237-47 East Tioga St., Philadelphia, Pa.
"Let us quote on your requirements."

SPUR GEARS



AKRON

AKRON GEARS

Mean Fewer Gear Replacements

We make them with the thought of "Service" constantly in mind. That's why every Akron Gear, large or small, gives the kind of service that keeps things going.

Let us quote on your requirements.

The Akron Gear & Engineering Co.
Akron, Ohio

MOLOCH POWER HAMMERS

A Moloch Hammer in your shop will be an asset as long as the shop lasts. Guaranteed to give satisfaction, these hammers are real investments in service.

Belt or Motor Drive, made in sizes from 25 lbs. to 500 lbs.

MOLOCH FOUNDRY & MACHINE CO.
Kaukauna, Wis.

CHAMBERSBURG-NATIONAL

COMPLETE FORGING EQUIPMENT

CHAMBERSBURG ENGINEERING CO
CHAMBERSBURG, PA.

THE NATIONAL MACHINERY CO
TIFFIN, OHIO

Sales Offices
NEW YORK, 152 W. 42nd St. CHICAGO, 565 W. Washington St.
DETROIT, 2457 Woodward Ave.

NAZEL AIR HAMMERS AND DILL SLOTTERS

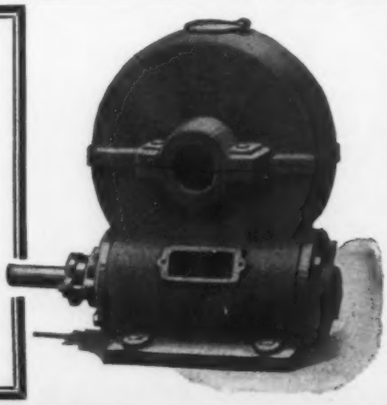
Nazel Engineering & Machine Works
4045 N. 5th St., Philadelphia, Pa.

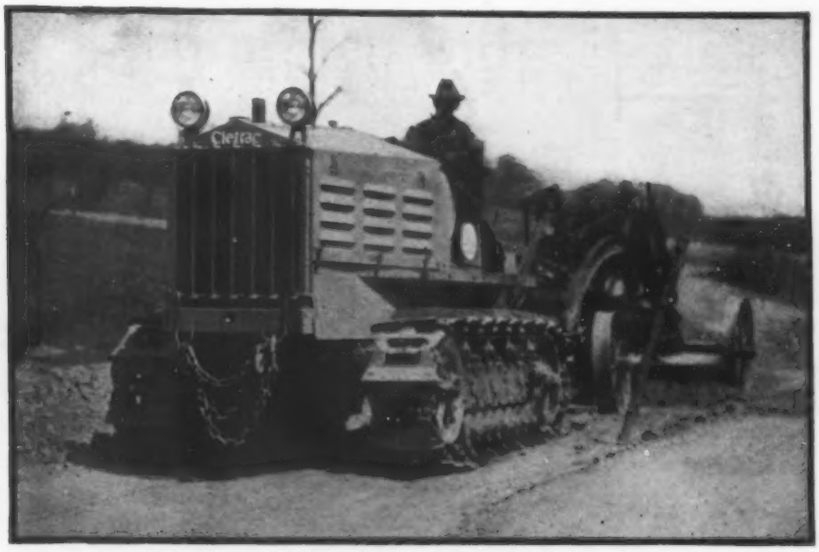
HINDLEY WORM GEARS

Send us your Inquiries for
WORM GEARS AND
WORM GEAR REDUCTIONS

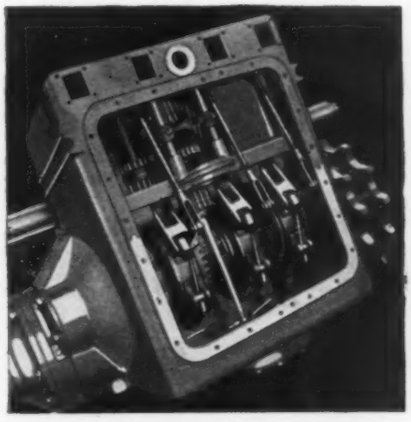
Catalogue on Request.

HINDLEY GEAR COMPANY
ENGINEERS
508 N. 19th Street
Philadelphia





DON'T GAMBLE . . . on GEAR strength



G & F transmission Gears in the sturdy "80-60" Cletrac

G & F Products

Drop, Flat Hammer and Upset Forgings, Cut Gears
Speed Reducers
Rolling Mill Machinery
Special Machinery
Bridge Operating Mechanisms

THERE are no "ordinary" loads for tractors or trucks. Jobs must go according to schedule. Overloads and severe strains are encountered almost daily.

Don't gamble on gear strength in such service as this. Transmissions built for heavy duty require gears with plenty of reserve strength . . . gears *designed* for severe strains and heavy loads.

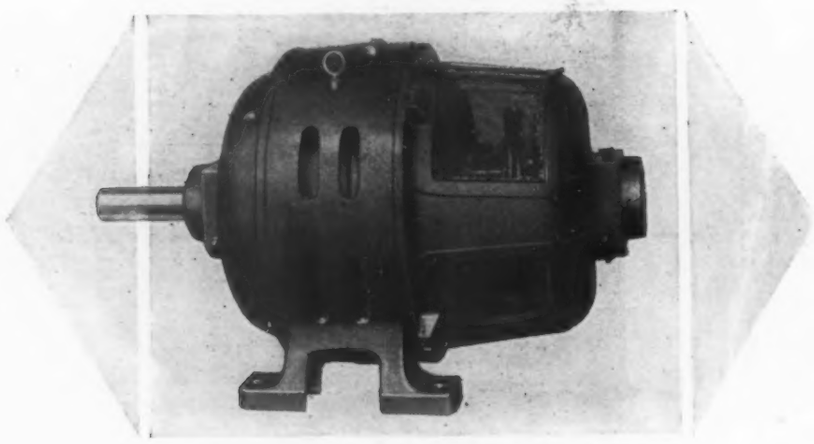
Transmission gears by G & F fully meet these requirements. They are accurately cut from alloy steel forgings supplied by our own Forge Division. Expert engineering service, complete production facilities and rigid inspection and tests are your guarantee of gear quality.

Don't gamble on gear strength. Send us your blue prints. You can rely on our recommendations — and on our gears.

GEARS AND FORGINGS, INC.
GENERAL OFFICES: 3124 WOODHILL ROAD, CLEVELAND, O., U.S.A.
District Offices: Chicago, Pittsburgh, Detroit, Buffalo, New York, Milwaukee, Indianapolis. *Factories:* Cleveland, Pittsburgh, Chicago, Ford City, Pa.

GEARS AND FORGINGS INC.

THEY KEEP A-RUNNING



10 Horse Power Century Type SR Slip Ring Induction 3 and 2 Phase Motor

FOR STARTING EXCEPTIONALLY HEAVY LOADS

Wherever starting conditions are especially severe or where speed reduction is desirable, Century Type SR Slip Ring Induction 3 and 2 Phase Motors are particularly recommended...When equipped with speed control, their speed can be varied down to one-half of their normal or maximum ratings.

These motors are well balanced in design—no one characteristic is over developed at the expense of another ...The shafts are liberally proportioned...The bearings last—they are made of phosphor bronze, the best bearing material obtainable... Enclosing covers can be furnished in screen, grided, drip proof, fully enclosed or dust proof types.

Built in standard sizes from ¼ to 15 horse power.

CENTURY ELECTRIC COMPANY
1806 PINE ST. • • ST. LOUIS, MO.
40 U.S. and Canadian Stock Points and More Than 75 Outside Thereof

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS

Century MOTORS

MOTOR GENERATOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS

FOR MORE THAN 26 YEARS AT ST. LOUIS

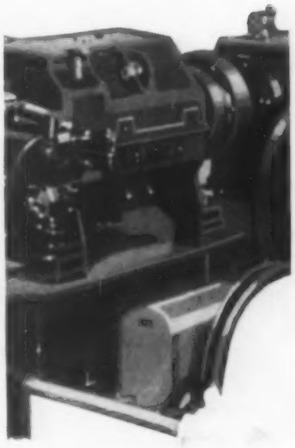
If production is to keep in step with schedules

both *weak spots must be protected*

IN any steel-mill production unit, there are two factors to be considered when selecting Motor Control . . . the motor and the operator; the motor, because it can burn; the man, because he can tire.

It is not enough that Motor Control protects the motor. It *must* do this . . . but the control you choose should also aid the operator keep production in step with your schedules.

He must have Motor Control which responds uniformly to his master switch . . . Motor Control which accelerates all loads—regardless of size—in uniform time . . . so operation of his equipment becomes a habit to him. Otherwise if motor-acceleration delays on heavy loads and races on light, he is thrown out of his stride, kept constantly on the alert; too great a demand is made on his energy . . . and his output slumps inevitably as the hours of the day drag on.



Cutler-Hammer *L*tl Control accelerates all loads *uniformly* . . . smoothly, easily—*and speedily!* getting the utmost out of the motor at the same time guarding it infallibly against dangerous overloads. The time of acceleration is always uniform, permitting the operator to develop operation of his machine into skilled habit so he maintains the same steady work-devouring pace all day long.

Furthermore, there are no delicate moving parts or relays on the accelerating circuit. C-H *L*tl is simple, rugged, durable. Its record during 5 years' performance in every type of application proves its excellence. C-H *L*tl is described fully in the booklet *"Steel Must Never Stop."* Send for a copy.

CUTLER-HAMMER, Inc.
Pioneer Manufacturers of Electric Control Apparatus
1260 St. Paul Avenue
MILWAUKEE, WISCONSIN

CUTLER HAMMER

The Control Equipment Good Electric Motors Deserve

(A-240)

DO YOU KNOW?

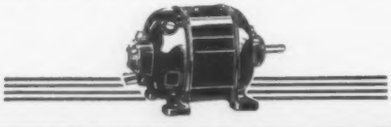
That Leland Motors are found in the shadows of the Pyramids, in the sweltering heat of Singapore, in the Arctic regions of Alaska, in the undeveloped wilds of China!

Do you know that Leland Motors operate quietly, carry their loads unobtrusively year in and year out, require almost no attention; that bearing failure is almost unknown in Leland Motors, and that short-circuiting trouble never occurs!

A. C. Repulsion Induction
D. C. Compound Wound
A. C. Polyphase

All in Interchangeable Frames.

THE LELAND ELECTRIC CO.
DAYTON • OHIO • U.S.A.



H 1/8
O 1/6
R 1/4
S 1/3
E 1/2
P 3/4
O 1
W 1½
E 2
R 3

Leland Motors

BSC LINE OF POWER HAMMERS
Barbour-Stockwell Co. Cambridge, Mass.

PICKLING TANKS
for Steel and Galvanizing Plants. 4" to 8" Dense-Grained, Untapped Yellow Pine. Any length, depth or width. Special Pocket Joints, sealed with Acid-Resisting Plastic. Anti-Acid rods if desired.
G. WOOLFORD WOOD TANK MFG. CO.
P. O. Paschall, Philadelphia, Pa. Factory: Darby, Pa.

SINCE 1854

HORTON TANKS
And Steel Plate Work
Flat-bottom Storage Tanks
Hortonsphere Gas Holders
Penstocks & Surge Tanks
Steel Pipe Kilns
Steel Plate Work
Elevated Tanks
CHICAGO BRIDGE & IRON WORKS

Sales Offices
Chicago.....2148 Old Colony Bldg.
Birmingham....1528 Fiftieth St., N.
New York...3149 Hudson Terminal
Dallas.....3348 Magnolia Bldg.
Cleveland...2238 Union Trust Bldg.
Atlanta.....1048 Healey Bldg.
Detroit.....1528 Lafayette Bldg.
Boston.....1513 Consol. Gas Bldg.
Philadelphia....1627 Jefferson Bldg.
B-125 San Francisco.....1049 Rialto Bldg.

"JASCO" TANKS
TANKS FOR GASOLINE — OIL — AIR — ETC.
COMPRESSED GAS CYLINDERS
—JOS. A. JANNEY, Jr.—
Successor to
JANNEY-STEINMETZ & CO.
PHILADELPHIA NEW YORK

TANK AND STEEL PLATE CONSTRUCTION
MAXWELD STEEL PRODUCTS
MAXWELD CORP.
140-13TH ST., BROOKLYN N.Y.
SUPER-SECURITY

COLE TANKS
STAND PIPES -:- PLATE WORK
ELEVATED TANKS
BOILERS -:- STACKS
R. D. COLE MFG. COMPANY
NEWNAN Est. 1854 GA.
NEW YORK OFFICE: 5 BEEKMAN STREET

LEAD LINED TANKS
Wood or Steel
For Pickling or Storage of Acids.
Sheet Lead Work and Chemical Lead Burning of every description.
Homogeneous Lead Coatings (Gross Formula) for equipment using High Temperature, High Pressure or Vacuum.
GROSS LEAD BURNING & COATING CORP.
3959 West 25th St. Cleveland, Ohio

TANKS & STACKS
STEEL PLATE PRODUCTS CO.
POTTSTOWN, PA.
STEEL PLATE CONSTRUCTION

Longer Runs! Higher Production! Longer Die Life!

These are the things that have brought ACME Upsetting and Forging Machines into the lead. Nor is the variety of work limited when ACME Machines are used, for their range includes every type of forging from the roughest to jobs whose tolerances are as close as .003″.

ACME Upsetting and Forging Machines are built in 10 sizes from ¾″ to 5″. All of them are designed and constructed for the heavy duty you expect of them.

Full particulars will be sent on request.

THE ACME MACHINERY CO.

COR. ST. CLAIR AND HAMILTON STS., CLEVELAND, OHIO

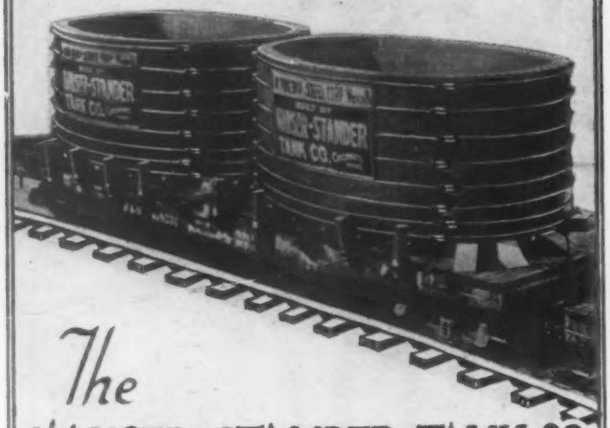
DETROIT OFFICE: 5185 LORAINE ST.

EUROPEAN AGENTS:

Burton, Griffiths & Co., London, England. Claenzer & Perreaud, Paris, France. Ing. Ercole Vaghi, Milan, Italy. Henry W. Peabody & Co., Melbourne, Australia. Isbecque Todd & Co., Brussels, Belgium.

SPECIALISTS IN

HEAVY PICKLING *AND* ACID STORAGE TANKS



The
HAUSER-STANDER TANK CO.
CINCINNATI, OHIO U.S.A.
"We Win With Quality"

SCAIFE COPPER-BRAZED TANKS

for Air, Gas and Liquids

Welded Tanks Riveted Tanks Rivet Weld Tanks

A.S.M.E. Tanks

I.C.C. Tanks

WATER SOFTENERS and FILTERS
(128 years old—Founded 1802)
WM. B. SCAIFE & SONS CO.
Main Office, OAKMONT, PA.
Pittsburgh New York Chicago

TANKS and STEEL PLATE CONSTRUCTION

370 Lexington Ave. New York City
Land Title Bldg. Philadelphia

LANCASTER IRON WORKS
INCORPORATED
LANCASTER, PA.

P.I.W. STEEL PLATE CONSTRUCTION

ANNEALING BOXES, STACKS, ELEVATED TANKS, TANK CARS AND WELDED BOXES, BINS, OR KETTLES—GENERAL STEEL PLATE CONSTRUCTION.

THE PETROLEUM IRON WORKS COMPANY
Sharon, Pa.
Plants—Sharon, Pa.
Branch Offices—New York, Chicago, Tulsa

AIRTIGHT STEEL TANK COMPANY
PITTSBURGH, PENNA.

TANKS FOR: High pressure gas and air storage—Pneumatic water systems—Gasoline and oil storage—Oil burning equipment—Open top—Welded. ASTCO Genuine Copper Brazed Tanks for high pressure—the tightest, safest, strongest tank it is possible to construct by any known process.—ASME code tanks.

THE MEEHAN BOILER & CONSTRUCTION CO.

STEEL PLATE WORKS

Fabricators and erectors of self-supporting Steel Stacks, Breechings, Piping, Tanks, Chutes, Bins, etc., riveted or welded, for Blast Furnaces, Steel and Power Plants and other Industries.

LOWELLVILLE, OHIO

SHOEMAKER BRIDGE CO.

Bridges and Buildings

NEW YORK POTTSTOWN PHILADELPHIA

McClintic-Marshall Company

Steel Bridges *and* Buildings

Tanks, Barges, Pipe, Transmission Towers

and Plate Work

General Offices: PITTSBURGH, PA.

OFFICES IN PRINCIPAL CITIES

Kellogg forge and hammer lap welded steam boiler drum. 54 in. I. D. x 2-9/16 in. thick. Length of straight shell between ellipsoidal heads 24 ft., 6 in. Heads 2-1/4 in. thick. Fitted with one 10 in. forge and hammer lap welded steam nozzle with threaded couplings inside for dry pipe connection; three 3 in. nozzles in shell for safety valves; two 1-1/2 in. nozzles in each head for water column connections; one 4 in. nozzle in each head for feed connections, and one 2-1/2 in. nozzle in head for purifier drain. Working pressure 450 lbs., tested at 900 lbs.

First of 3 new units for a central station *again specifying Kellogg drums*

Central station and other power engineers who repeatedly specify Kellogg units testify to the consistent economy of Kellogg performance. The Kellogg boiler drum shown is the first of three new units for a central station that has had long experience with Kellogg drums.

The Kellogg forge and hammer lap welded process invests every Kellogg drum or other pressure vessel with a degree of strength not found in a cast or riveted unit. From the hot bending of the plate to the testing of the finished unit, each Kellogg vessel is made to provide more than the expected life and correspondingly greater safety and efficiency.

Kellogg drums are free from cold worked zones and are not subject to caustic attack. The records of Kellogg installations are impressive. Write for further facts.

THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK

Birmingham	827 Brown-Marx Building	Pittsburgh	Oliver Building
Boston	12 Pearl Street	Los Angeles	742 Western Pacific Building
Chicago	1 La Salle Street	Tulsa	Philtower Building

KELLOGG

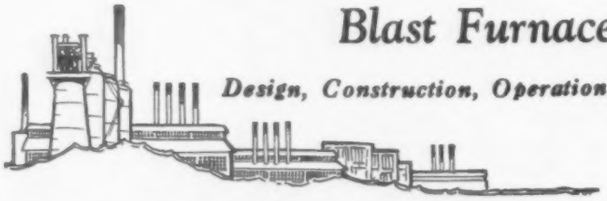
FORGE AND HAMMER LAP WELDED BOILER DRUMS . . . RECEIVERS . . . SEPARATORS HEADERS . . . COMPLETE POWER PLANT PIPING

ALL KELLOGG FORGE AND HAMMER LAP WELDED PRODUCTS ARE INSURABLE

ARTHUR G. McKEE & COMPANY

ENGINEERS CONTRACTORS

Blast Furnaces and Steel Plants



Design, Construction, Operation, Management, Appraisals, Investigations

2422 Euclid Ave., Cleveland, Ohio

London Office, Bush House, Aldwych, W. C. 2

A New Plant Quickly?

100,000 sq. ft. in 60 working days.
Permanent, high grade construction.
Designed and built by Austin

THE AUSTIN COMPANY · Cleveland

Design and Construction *Branch Offices from Coast to Coast*

H. A. BRASSERT & Co.

Consulting Engineers

Blast Furnace, Steel Plant and Rolling Mill Design and Construction

Operation and Management
Financial and Technical Reports
Appraisals

CHICAGO
810 S. Michigan Ave.

Brookhouse-Walbrook
LONDON
E. C. 4

STEEL BUILDINGS, BRIDGES, ETC.

Virginia Bridge & IRON CO.

Roanoke Birmingham Memphis Atlanta New York New Orleans
Los Angeles Tampa Dallas El Paso Havana

PERIN & MARSHALL

CONSULTING ENGINEERS

Investigations, Reports, Development of Raw Materials, Ore Sintering, Coke Ovens, Blast Furnaces, Open Hearth and Electric Steel Plants, Rolling Mills, Power Plants, Cement Plants

11 WEST FORTY-SECOND ST., NEW YORK
Cable Address PERINMARSH

GAS, OIL COAL **FURNACES** DIRECT REGENERATIVE RECUPERATIVE

BLAST, OPEN HEARTH, CRUCIBLE, SOAKING PIT, HEATING FURNACES OF EVERY DESCRIPTION, TUBE WELDING AND BENDING, ANNEALING AND FORGING FURNACES.

HIGHLAND BLDG **GEO. NAISMITH & SON** PITTSBURGH, PA.

Pennsylvania Engineering Works

New Castle, Pa.

Engineers and Contractors

Builders of

Blast Furnace and Steel Mill Equipment
Heavy Plate Work and Machinery

ALEX LAUGHLIN & CO.

PITTSBURGH, PA.

ENGINEERS & CONTRACTORS

FURNACES AND GAS PRODUCERS FOR IRON & STEEL WORKS

James Criswell Company

ENGINEERS and CONTRACTORS

MELTING AND HEATING FURNACES
SIEMAN'S REVERSING VALVES

KEENAN BLDG. PITTSBURGH, PA.

BELMONT IRON WORKS

PHILADELPHIA NEW YORK EDDYSTONE

Engineers – Contractors – Exporters

STRUCTURAL STEEL

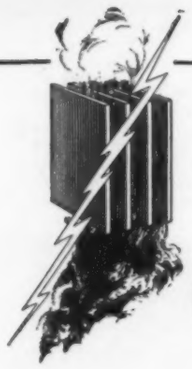
Complete Industrial Buildings

THE S. R. SMYTHE CO., Inc.

CONTRACTING ENGINEERS

OPEN HEARTH—SOAKING PITS
HEATING FURNACES
SCHILD GAS REVERSING VALVE

OLIVER BUILDING PITTSBURGH, PA.



COTTRELL

ELECTRICAL PRECIPITATION PROCESSES

for the removal of

DUSTS, FUMES, MISTS, TARS

and OTHER SUSPENDED MATTER from GASES

The following applications of the Cottrell Processes are established by satisfactory performance and the removals effected being only dependent on the Purchasers' requirements.

By-Product Coke Oven Gas	95%—99%	removal
Powdered Coal Ash	90%—95%	"
Hot Roaster Gas	95%—99%	"
Sulphuric Acid Mist	95%—99%	"
Contact Acid Gas Purification	99%	"
Phosphoric Acid Recovery	95%—99%	"
Carburetted Water Gas	95%—99%	"
Carbon and Lamp Black	95%—99%	"
Miscellaneous Applications	90%—99%	"

Our experience gained through the construction and successful operation of Cottrell Electrical Precipitation Process Installations of a total gas capacity exceeding 10,000,000 cubic feet per minute treating different types of gases enables us to intelligently study any new problem in gas cleaning. If our Process can be adapted, we are prepared to offer a complete installation guaranteed to effect the desired result.

Gas Detarring
Blast Furnace Gas Cleaning
Powdered Fuel Ash Removal
Carbon and Lamp Black Recovery
Asphalt Products Recovery
Non-Ferrous Metal Treatments

RESEARCH CORPORATION

405 Lexington Avenue
NEW YORK, N. Y.
Chicago Office, 343 S. Dearborn Street
Plant and Laboratory, Bound Brook, N. J.

Air Cleaning
Food Products Recovery
Paper & Pulp Mill Processes
Sulphuric Acid Recovery
Roaster Gas Cleaning
Miscellaneous Acid Recovery

JULIAN KENNEDY
ENGINEER
PITTSBURGH PA., U. S. A.
Cable Address, ENGINEER, Pittsburgh

ROL MAN
MANGANESE STEEL
ROLLED and FORGED PRODUCTS
BAR SHAPES WIRE PLATES SHEETS FORGINGS
"ROL-MAN" DOUBLE LOCK MESH SCREENS
MANGANESE STEEL FORGE COMPANY
Richmond St. and Erie Ave., Philadelphia, Pa., U. S. A.

ARTHUR L. STEVENS CORPORATION
Engineers
205 WEST WACKER DRIVE, CHICAGO, ILLINOIS
Open Hearth Furnaces, Soaking Pits.
Continuous and Regenerative Heating Furnaces.

MOLTRUP'S
COLD DRAWN STEEL
AND STEEL SPECIALTIES
MOLTRUP STEEL PRODUCTS CO.
BEAVER FALLS, PA.

Duff Patents Co., Inc.
321 Union Trust Bldg., Pittsburgh, Pa.
Mechanical and Hand-poked Gas Producers, Steel Stacks, Tanks, Rotary Dryers, Calciners, Steel Riveted Pipe and Steel Plate Construction.

"FROM MINE TO MARKET"
Rods
Wire
Billets
Slabs
Nails
WHEELING STEEL
Sheets
To Meet
Every
Manufacturing
Requirement
Reg. U. S. Pat. Office
WHEELING STEEL CORPORATION, Wheeling, W. Va.

THOS. J. LLEWELYN & Co.
INDUSTRIAL ENGINEERS
911 OLIVER BUILDING PITTSBURGH, PA.
ROLLING MILLS and PIPE MILLS
for Iron, Steel, Copper, and Brass
LIQUIDATIONS • REPORTS • APPRAISALS

SIMONDS SAW and STEEL CO.
Permanent Magnet Steels
High Nickel, Low Expansivity Steels
High Nickel Alloys
Tool and Special Analysis Steels
Bars LOCKPORT, N. Y. Sheets

CEMENTILE ROOFS
The FIRST COST is the LAST
AMERICAN CEMENT TILE MANUFACTURING CO.
OLIVER BUILDING
PITTSBURGH, PA.

BLISS & LAUGHLIN, Inc.
COLD DRAWN STEELS and SHAFTING
Rounds—Squares—Hexagons—Flats
BLISS & LAUGHLIN, Inc.
Western Mill and General Offices: Harvey, Ill.
Chicago Warehouse: 1023-1027 W. Jackson Blvd.
Eastern Mill: Buffalo, N. Y.
Offices in Principal Cities

TRADE MARK A·SCO REG. U.S. PAT. OFF.
STEEL
(CUSTOM MADE)
is produced to meet the exacting requirements of those who need Steel of special analysis.
THE ANDREWS STEEL CO., Newport, Ky.

TONCAN COPPER
Mo-lyb-den-um IRON
Resists Rust!
—That's the whole story in a nut shell.
Write for Booklet
Central Alloy Steel Division
REPUBLIC STEEL CORPORATION, Youngstown, Ohio

INGOT-MOULDS
Direct or Cupola Metal—All Shapes and Sizes

VALLEY MOULD AND IRON CORPORATION

Western Offices:
108 St. and Calumet River
South Chicago, Ill.

Main Office—Hubbard, Ohio

Plants:
Hubbard, Ohio
Sharpsville, Pa.
South Chicago, Ill.

"The Largest Manufacturers of Ingot Moulds in the World"

Leading Manufacturers Say!

"there is no sounder specification for **wearing parts"**

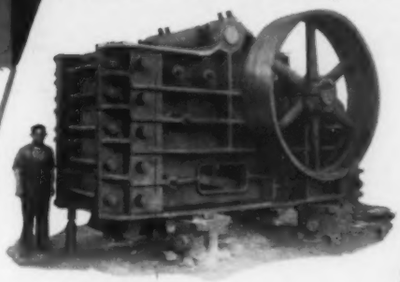
The Linn Tractor-

"TISCO equipped"
with driving and idler sprockets, side bars, rollers, runner blocks, grousers, ice creepers and track shoes of Tisco manganese steel.

Smidth Tubemills -

"TISCO equipped"
with grates of dependable Tisco manganese steel.

Buchanan Primary Crusher



"TISCO equipped"
with jaw and cheek plates, and toggle bearings of Tisco manganese steel.

Morris Dredge

"TISCO equipped"
with pump liners, impellers and suction disc liners of Tisco manganese steel.

TISCO
MANGANESE STEEL

These and other leading manufacturers demonstrate how successfully today's wear-resisting requirements in heavy duty equipment and machinery can be met with the proper selection of steel.

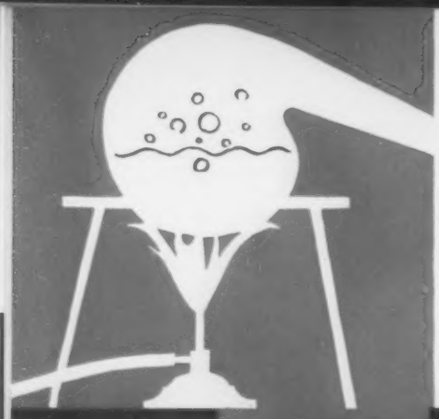
Wherever adequate protection against severe abrasion, impact and shock is essential to keep wheels moving and maintenance low, long-wearing 14% manganese steel is employed. Selection of the kind of steel logically comes first.

But of equal importance is the selection of the manufacturer. In standardizing on Tisco manganese steel these manufacturers assure users of their equipment long, continuous service, and low operating costs.

TAYLOR-WHARTON IRON & STEEL COMPANY

HIGH BRIDGE, NEW JERSEY

Sales Offices : BOSTON CHICAGO HOUSTON LOS ANGELES MONTREAL TAMPA NEW YORK PHILADELPHIA PITTSBURGH SAN FRANCISCO SCRANTON



Science Contributes NEW QUALITIES

to wear-resisting *Manganese Steel*

TISCO

TIMANG
TIMAXX

NO LONGER is the use of 14% manganese steel limited to cast applications. The alloying principle has brought new qualities to this familiar metal — famed for its resistance to severe abrasion and wear.

TIMANG—the new 14% manganese steel, is available in all rolled forms. It can be cold worked, stamped, drawn, welded and otherwise fabricated. Manufacturers and users have adopted it for screen cloth, screen plate, elevator buckets, pedestal liners and countless other products subject to extreme wear; as well as for many applications in the electrical industries, due to its non-magnetic qualities.

TIMAXX—likewise 14% manganese steel, resists the temperatures encountered in many industrial applications. Twist delivery guides, draw bench chain, bending dies, run-out racks, etc.—give far longer service when cast from TIMAXX.

You will want to learn more about these new wear-resisting manganese steels—and their possible applications in your plant or product. Write direct to High Bridge, or communicate with the nearest TISCO office. There is one convenient to you.

TAYLOR - WHARTON IRON & STEEL CO.

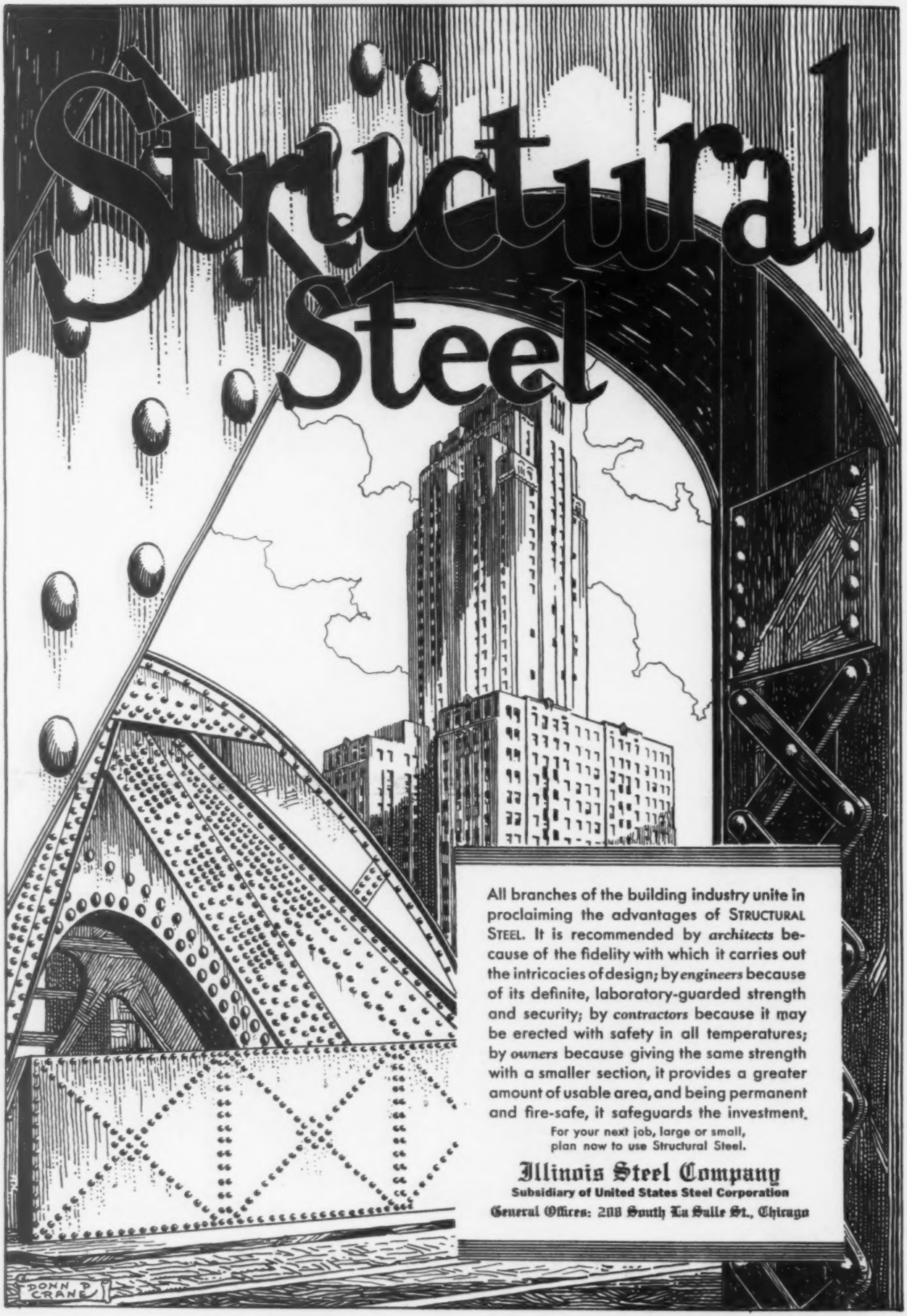
HIGH BRIDGE, NEW JERSEY

SALES OFFICES : New York, Boston, Philadelphia, Chicago, Pittsburgh, Houston, San Francisco, Los Angeles, Scranton, Montreal, Tampa

TW

This organization offers the most helpful co-operation, including a staff of field metallurgists, to assist manufacturers in choosing cold finished steels for specific uses and determining correct operating methods

UNION DRAWN STEEL CO.



All branches of the building industry unite in proclaiming the advantages of STRUCTURAL STEEL. It is recommended by *architects* because of the fidelity with which it carries out the intricacies of design; by *engineers* because of its definite, laboratory-guarded strength and security; by *contractors* because it may be erected with safety in all temperatures; by *owners* because giving the same strength with a smaller section, it provides a greater amount of usable area, and being permanent and fire-safe, it safeguards the investment.

For your next job, large or small, plan now to use Structural Steel.

Illinois Steel Company

Subsidiary of United States Steel Corporation

General Offices: 208 South La Salle St., Chicago

SMITH-YOUNG TOWER
Atlee B. & Robt. M. Ayres, Architects.
McKenzie Construction Co., General Contractors. Virginia Bridge & Iron Co., Fabricators and Erectors of the Steel Work.
Another
Glorious Tower
Salutes the Southern Sky
THIS thirty-one-story addition to the sky-line of San Antonio exemplifies to a marked degree the modern trend in architecture. Beauty of line and detail, refinement of finish, efficiency in lay-out and operation have been attained through artistic and practical conception and faithful execution.
The necessarily inherent qualities . . . strength, safety, durability, fire-resistance . . . have been built in through the use of TENNESSEE STRUCTURAL STEEL.

Tennessee Coal, Iron & Railroad Company

General Offices: Brown-Marx Building, BIRMINGHAM, ALA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES OF UNITED STATES STEEL CORPORATION:

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY
CARNEGIE STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
ILLINOIS STEEL COMPANY
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R. R. COMPANY
UNIVERSAL ATLAS CEMENT COMPANY

Pacific Coast Distributors—United States Steel Products Co., Columbia Department: San Francisco, Los Angeles, Portland, Seattle, Honolulu. *Export Distributors*—United States Steel Products Co., New York City

SERVICE
and
QUALITY

WYCO STEELS

COLD DRAWN

Wyckoff Drawn Steel Company

General Offices: Frick Building, Pittsburgh, Pa.

P. O. Box No. 54

Chicago Office: 3200 So. Kedzie Ave., Chicago, Ill.

Mills { Ambridge, Pa.
Chicago, Ill.

SALES OFFICES: Boston, 627 New Chamber of Commerce Bldg.; Cleveland, Rockefeller Bldg.; Dayton, 1128 The Third National Bldg.; St. Louis, Mo., Planters Bldg.; Philadelphia, 139 South 36th St.; Kansas City, Mo., 622 Reliance Bldg.; Buffalo, N. Y., White Bldg.
DETROIT OFFICE AND WAREHOUSE: Craine-Schrage Steel Co., 6189 Hamilton Ave.
PACIFIC COAST REPRESENTATIVE: F. H. Currie, 309 Pacific Mutual Bldg., Los Angeles, Calif.

WASHBURN PRODUCTS

RODS ROUNDS-FLATS-SHAPES (HOT ROLLED)
HIGH CARBON and WELDING WIRE
ALLOY STEELS-SPECIAL ANALYSES
BILLETS

WASHBURN WIRE COMPANY
SUPERIOR
STEEL
PRODUCTS
PHILLIPSDALE, R.I.

WASHBURN WIRE CO.
PHILLIPSDALE RHODE ISLAND

ALL THE WAY DOWN THE LINE..

KINITE DIES SAVE MONEY

IN THE ORIGINAL CASTING

Kinite dies are cast to shape (with only a small machining allowance), already cored or with reinforcing ribs if needed. Because of this fact, there is *always* a saving in material.

IN THE HEAT TREATMENT

Kinite is air-cooling and takes its maximum hardness by natural slow cooling in still air. It requires no quenching. Temperature changes are easily held uniform throughout the process. Because of these properties and Kinite's fine grained, unstratified structure, distortion and shrinkage are negligible. Kinite Dies never crack, and if reasonable care is used, according to instructions, you will lose no Kinite Dies during heat-treatment.

Kinite Punch and Die for blanking electric refrigerator fans—a typical one-piece Kinite Casting. The machine-labor saved on such intricate shapes reduces die-costs to a minimum.

ON THE PRESS . . .

The longer a die can stay on the press, demanding of no attention, causing no stopping of the press, no idleness, the more efficient a productive tool it is. Kinite Dies stay on the press 3, 10, 20 times as long, or more, without attention. This results in a decided savings in idle presses and non-productive time.

IN THE MACHINING

Kinite Dies reach you in the rough finished form. Only a little machining is necessary and often on dies for certain operations, a filing and scraping completes the die. The savings in machining time and labor often pays the entire cost of the die.

IN DIE MAINTENANCE

Kinite Dies need little or no attention. The majority of regrinds are eliminated and even in heavy blanking operations, there have been runs as high as 300,000 with no more attention than a touching up.

See the back of this announcement for description of IRONITE-Partner of KINITE

KINITE

for **SHORTER PRODUCTION SCHEDULES**

Use Low-cost IRONITE

The *New* Cast-to-Shape Alloy Iron

IRONITE, partner of Kinite, is a wear-resisting alloy for shorter schedules, an alloy at a lower price than ordinary tool steels, an alloy which is cast-to-shape and reduces machining costs to the minimum.

IRONITE is an electric furnace alloy and among other alloys, chrome, nickel and vanadium play an important part in its composition. Its superior properties are the result not only of its alloy content but as well the combination of correct alloying, melting, moulding, and pouring.

IRONITE is cast to any shape and very little machining time and expense are necessary in your shop. Dies cast from IRONITE are quickly made ready to go into production. No heat-treatment is required.

IRONITE is invaluable where initial costs are important . . . . where drawing and forming dies are used on shorter runs . . . . where any refined, close-structured iron alloy is needed.

IRONITE is also used for machine parts such as cams, gears, machine bases . . . any application where a rigid, wear-resisting metal of uniform structure is required.

Mail the coupon below for a folder describing IRONITE in detail . . . also for booklet on KINITE, the cast-to-shape Steel Alloy described on the preceding page.

KINITE CORPORATION
FOOT OF PARK PLACE, MILWAUKEE, WISCONSIN
Warehouses: Detroit, Cleveland, New York, Buffalo

REPRESENTATIVES:
BISSETT STEEL CO.,
Cleveland, Cincinnati, Pittsburgh, Buffalo
H. BOKER & COMPANY, Inc., New York, Boston
DANLY MACHINE SPECIALTIES, Inc.
2122 S. 52nd Ave., Chicago, Ill.

KINITE CORPORATION
Foot of Park Pl., Milwaukee, Wis.

Check which is wanted
- ☐ Please send copy of KINITE 44-page Booklet No. 12, describing KINITE.
- ☐ Send me a copy of the folder describing IRONITE, the new alloy iron.

Name_____

Mail this coupon for descriptive matter on

IRONITE OR KINITE

STRUCTURAL STEEL *of Course*

WHEN called upon to design a huge project such as the Cleveland Union Terminal pictured below, architects and engineers turn naturally to Structural Steel. They know its Strength, its Safety. They know its adaptability to their needs. An enormous tonnage of Structural Steel required for the Cleveland Terminal project was supplied by Carnegie Steel Company . . . . . .

In the underground approaches to the Terminal, and in the elimination of numerous grade crossings, Carnegie Beams were used extensively. These beams with their wide parallel flanges bring to steel construction a simplicity of fabrication and erection heretofore unknown. Carnegie Beams merit the investigation of those interested in economical and efficient steel construction . . . . . .

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH - PA.

THE PHOENIX IRON CO.

MANUFACTURERS OF OPEN HEARTH

Structural Steel Shapes, Beams, Channels, Angles and Ship Shapes

Works: Phoenixville, Pa. Main Office: Philadelphia, Pa.

Offices: 22 S. 15th St., Philadelphia; 110 State St., Boston; 314 City Savings Bank Bldg., Albany, N. Y.; 30 Church St., New York; Munsey Building, Washington; 26 Victoria St., London

THE PHOENIX BRIDGE CO.

Engineers, Fabricators and Erectors
CAPACITY 60,000 TONS

Bridges and Other Structures of Steel
Works and Engineering Office: Phoenixville, Pa.

HOT ROLLED STEEL

Electric and Open Hearth

Tool—Alloy—Carbon
Bars, Special Shapes
High Carbon Wire Rods

Driver-Harris Company
Harrison, N. J.

HELLER STEELS

Standard and Special Shapes
HIGH SPEED, DIE AND SPECIAL
TOOL STEELS
SOLID AND HOLLOW DRILL STEEL
SPECIAL ALLOYS
We also make Rasps, Files (Vixen and Commercial) and Hammers

HELLER BROTHERS CO.
805 Mt. Prospect Ave.
Newark New Jersey

Since 1886

METAL MOULDINGS

COLD ROLLED IN ANY DESIRED SHAPE AND GAGE FOR
AUTOMOBILES
ELEVATORS
METAL FURNITURE
CABINETS
SIGNS, ETC.

Our Eng. Dept. will gladly offer suggestions.

BRITESUN, INC.
3735-39 BELMONT AVE. CHICAGO, ILL.

"DARWIN"

QUALITY
The ultimate in the evolution of
TOOL STEELS
Non-Deforming, Oil-Hardening "NEOR"
Air-Hardening—Patent Cobaltcrom "PRK-33"
which can also be used in the form of
CASTINGS
DARWIN & MILNER, INC.
1260 West 4th Street, CLEVELAND, OHIO

WETHERELL BROS. CO.

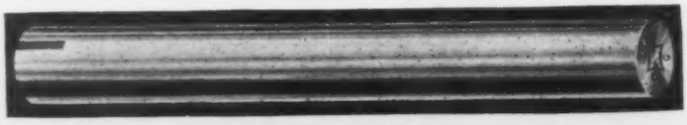
251 ALBANY ST. CAMBRIDGE, MASS.

C.R. STRIP STEEL
C.D. SCREW STOCK
NEEDLE WIRE
TOOL STEEL
DIE BLOCKS
DRILL RODS
STAINLESS STEEL
CUTLERY STEEL
O.H. SPECIALTIES

WETHERELL BROS. CO. 251 ALBANY ST. CAMBRIDGE, MASS. STEEL

CUMBERLAND

TURNED *and* GROUND SHAFTS
"Ground to Micrometer Accuracy"



CUMBERLAND STEEL COMPANY, CUMBERLAND, MD., U. S. A.

THE ATHENIA STEEL CO.

135 William Street, New York Works: Athenia, N. J.

Makers of High Grade Tempered and Polished Steel for Clock, Watch, Motor and Typewriter Springs, and Tempered and Untempered Steel for other purposes. Special quality equal to finest imported—both for finish and accurate rolling.

Illinois, Indiana, Michigan and Ohio Agents—Lapham-Hickey Co., 3333 West 47th Place, Chicago, and 414 United Artists Bldg., Detroit.
Wisconsin Agents—Mr. Frank W. Ladky, 445 Milwaukee St., Milwaukee, Wis.
New England Agents—Wetherell Bros. Co., 251 Albany St., Cambridge, Mass.
Philadelphia Agency—Hill-Chase & Co., Richmond and Ontario Sts., Philadelphia, Pa.

HIGH SPEED & [QUALITY Unexcelled] CARBON TOOL STEEL

LATROBE ELECTRIC STEEL CO., Latrobe, Pa.

NEWPORT ELECTRICAL SHEETS

Made for your particular requirements. We maintain, at your service, a highly specialized department for the production and betterment of high grade Electrical Steel Sheets.

THE NEWPORT ROLLING MILL CO.
NEWFORT "SAVE WITH STEEL" KENTUCKY

EDGAR ALLEN

HIGH SPEED and SPECIAL STEELS

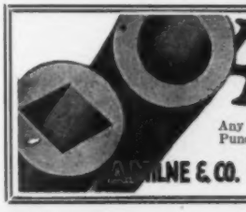
EDGAR ALLEN STEEL CO., Inc.
New York 741 Washington St. Branches in Principal Cities Chicago 21 N. May St.

Columbia TOOL STEEL

CLARITE HIGH SPEED STEEL
OILDIE NON-SHRINKING
COLUMBIA SPECIAL CARBON TOOL STEEL
COLUMBIA EXTRA, ETC.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY



AMCOH

ROLLED HOLLOW DIE STEEL
OIL HARDENING

Any size—Any Wall Thickness. For Ring Dies, Punches, Sleeves, Bushings, Cut-edges, etc.

ARMINE & CO. 745 Washington Street, New York. 8 Oliver Street, Boston. 17 North May Street, Chicago
And Branches in Principal Cities

HIGH SPEED
CARBON ALLOY
TOOL STEEL

VANADIUM-ALLOYS STEEL CO.

LATROBE, PA.

EASTERN
NORMITE

FOR YOUR MOST DIFFICULT STAMPINGS

THE EASTERN ROLLING MILL CO.
BALTIMORE, MD.

DRILL RODS

GLOBE POLISHED - BLUE CHIP HIGH SPEED
QUALITY - ACCURACY - UNIFORMITY

GLOBE WIRE COMPANY
SHARPSBURG, PA.

SENECA Full Finished Sheets

for FURNITURE — *Bodies, Cowls, Hoods,*
AUTOMOBILE — *Doors, Aprons, Radiators*
also ENAMELING & JAPANNING SHEETS
BLACK SHEETS

SENECA IRON & STEEL CO., Buffalo, N. Y.

JESSOP STEEL COMPANY'S "WASHINGTON"

Carbon Tool Steel

(America's Best Cast Steel)

"Washington" Carbon Tool Steel is a genuine product of the crucible. It embraces all that is best in High Quality Carbon Tool Steels.

JESSOP STEEL COMPANY

WASHINGTON, PENNSYLVANIA

NEW YORK, 201 Pearl Street
HARTFORD, 626 Capitol Ave.
CHICAGO, 230 N. Jefferson St.
DETROIT, 2208 Fort St., W.
CINCINNATI, 12 E. Second St.
CLEVELAND, 1277 W. Ninth St.
TORONTO, ONT., 77 Front St., E.
PHILADELPHIA, PA., Morgan Steel Co., 1930 Callowhill St.
YOUNGSTOWN, OHIO, Youngstown Steel Sales Co.
ST. LOUIS, MO., Service Alloy Steel Co.
DAYTON, OHIO, Quality Steels, Inc.
INDIANAPOLIS, James S. Marlowe, State Life Building
SAN FRANCISCO, CAL., Fred E. Wissing, No. 1 Drumm St.
MILWAUKEE, WIS., G. C. Krueger, 201 Guarantee Bldg.
NEW ORLEANS, La., W. B. Edgar
ATLANTA, GA., C. W. Moore

Think of the Future-

Use Wrought Iron Sheets!

In 1919 the W. W. Patterson Company of Pittsburgh, Pennsylvania, investigated the repeated failure of one of their stacks. Had the destruction appeared only above the roof level, the matter probably would have been dropped and the failure attributed to the elements.

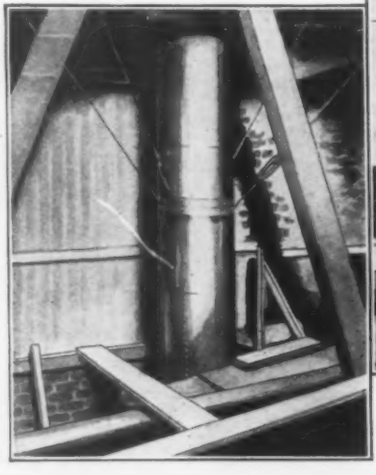
However, the investigation disclosed that failure had occurred not only above the roof level, but above the second floor level as well. From the ground to the second floor no failures were apparent. Analysis revealed that these lower sheets were of Genuine Wrought Iron.

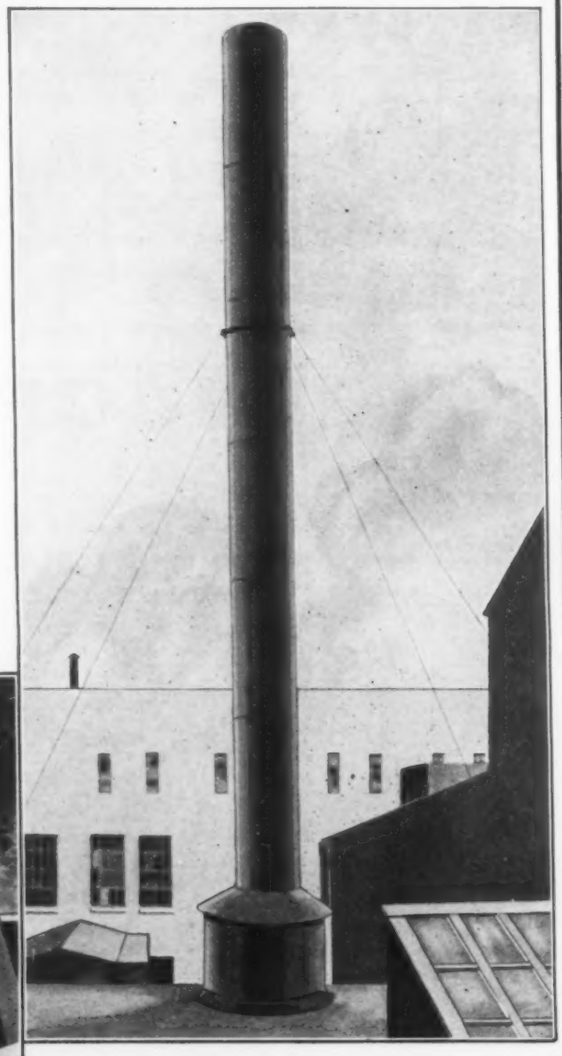
Replacement sheets of genuine Wrought Iron were installed and at present, after eleven years of service, they show no need for repairs.

Non-corrosive iron silicate, the Vital Element in the rust resistance of Wrought Iron, is distributed uniformly throughout the metal, thus providing a protective barrier against the destructive inroads of corrosion and the ravages of time. This is the reason for the long service life of Genuine Wrought Iron Sheets.

Sheets rolled by Sharon from Byers Genuine Wrought Iron are finding increased favor among those seeking permanence and low maintenance cost.

INVESTIGATE
Sharon
GENUINE
Wrought Iron
Sheets!





"W. W. Patterson Company's Smoke Stack."
The part of the stack that failed repeatedly.
On the left—the protected part above the second level to the roof; and above, the rest of the stack

SHARON STEEL HOOP COMPANY

SHARON **PENNSYLVANIA**

SHARON, PA.
CHICAGO.....McCORMICK BLDG.
CINCINNATI.....UNION TRUST BLDG.
CLEVELAND.....UNION TRUST BLDG.

WORKS
YOUNGSTOWN, O.
DETROIT.....GENERAL MOTORS BLDG.
NEW YORK.....CANADIAN PAC. BLDG.
PHILADELPHIA.....PACKARD BLDG.

LOWELLVILLE, O.
SAN FRANCISCO.....MONADNOCK BLDG.
SHARON.....STEEL HOOP BLDG.
ST. LOUIS.....PLANTERS BLDG.

CANADIAN REPRESENTATIVES
HUGH RUSSEL & SONS, LTD.....TORONTO, EXCELSIOR LIFE BLDG.....MONTREAL, ROYAL INSURANCE BLDG.

ACME

Hot and Cold Rolled Strip
Electro Galvanized Strip

....

Long Length Coils
or Cut-to-Length

1880 ACME STEEL COMPANY 1930
OUR GOLDEN ANNIVERSARY

General Offices: 2840 Archer Avenue ... Chicago

BROOKLYN DETROIT MILWAUKEE SAN FRANCISCO

STEEL

Hot and Cold Rolled Strip Steel

For All Purposes ¾ to 24 Inches Wide

QUALITY *and* SERVICE

WEST LEECHBURG STEEL COMPANY

General Offices: **Farmers Bank Building, Pittsburgh, Pa.**

NEW YORK—50 Church St.
NEW ENGLAND—236 N. Quaker Lane, West Hartford, Conn.
PHILADELPHIA—Edgcomb Steel Co., D Street below Erie Ave.
CHICAGO—1153 Peoples Gas Bldg.
NEWARK—Edgcomb Steel Corp., 350 Frelinghuysen Ave.
DETROIT—5-255 General Motors Bldg.
TOLEDO—Dean Higgins & Co., 906 Ohio Bldg.
CINCINNATI—1707 Union Central Bldg.
ST. LOUIS—1413 Chemical Building.

SAVE WITH STEEL

WAREHOUSE STOCKS of Cold Rolled Strip Steel are carried by

EDGCOMB STEEL CO., Philadelphia EDGCOMB STEEL CORP., Newark JOS. T. RYERSON & SON, Chicago

GRIFFIN
Cold Rolled Strip

Desired Quality *for* Forming *and* Drawing

Uniform quality in widths from ½" to 10"; and gauges from .002" to .500"; special tempers for forming and high class stamping work.

GRIFFIN MFG. CO. ERIE, PENNA.

DISTRICT SALES REPRESENTATIVES:

New York—Warehouse
Wm. H. Leonori & Co., Inc.
30 Howard Street.
Philadelphia—Warehouse
Wm. H. Leonori & Co., Inc.
The Morgan Steel Co.,
1230 Callowhill Street.
Chicago—Warehouse
Central Steel & Wire Co.
4545 S. Western Blvd., Chicago
Bellevue & Warren Aves., Detroit.
Boston—Warehouse
H. D. Evans Steel Co.
127 Oliver Street.
Buffalo—Sales Office
N. D. Tilbury
307 White Bldg.
Cleveland—Sales Office
The Paterson-Leitch Co.
900 East 69th Street.
Dayton—Warehouse
Central Steel & Wire Co.
1095 E. Monument Avenue.
Detroit—Sales Office
J. B. Tramer
801 Ford Bldg.
San Francisco—Sales Office
Charles L. Lewis
703 Market Street
Canada—Warehouse
Peckover's Limited
77 Front Street, East,
Toronto 2, Ontario.

"SAVE WITH STEEL"

HIGH GRADE

STRIP STEEL

STAMPING AND DEEP DRAWING UNIFORM IN QUALITY

Control of the Quality begins with the manufacture of the steel in our own Open Hearth and continues through all subsequent Processes

LACLEDE STEEL CO.
ST. LOUIS

Steel Works & Rolling Mills, Alton, Ill.

OFFICES: Detroit—Chicago—St. Louis—Kansas City

LESS FIELD WORK

LOWER COSTS

TAYLOR BUTT WELDING FLANGE

FOR ELECTRIC OR ACETYLENE WELDING TO PIPE

Forged from steel of highest quality especially suited for welding. Machine work accurate and flanges uniform in quality and workmanship. Furnished in all standards faced and drilled. Sizes 1" to 96" diameter.

WRITE FOR NEW BULLETIN 30-5

TAYLOR FORGE & PIPE WORKS, Chicago

BOX 485, CHICAGO 50 CHURCH ST., NEW YORK

PRECISION COLD ROLLED STRIP STEEL

SHIM STEEL .0015 AND HEAVIER

Up to sixteen inch widths in light gauges

THE COLD METAL PROCESS COMPANY

Youngstown, Ohio

One-Fifth the Weight of Cast Iron Pipe

One-third the Weight of Wrought Pipe

AN ABSOLUTELY TIGHT DURABLE PIPE

The lap riveted seam repeats its cycle every twelve inches, forming a broad stiffening rib of great value, and makes Root Pipe one-third stronger than any other type of pipe construction. Light weight and simple connections reduce transportation, handling and erection costs. Suitable for conveying water, air, gas, exhaust steam and powdered coal.

ABENDROTH & ROOT MANUFACTURING COMPANY

Pipe Specialists Continuously Since 1867 Sales Office: Woolworth Bldg., N. Y.

SUPERIOR

HOT and COLD ROLLED STRIP STEEL

Superior Steel Corporation

General Offices

Room 3122 Grant Bldg., Pittsburgh, Pa.

TUBING

SEAMLESS STEEL—COLD DRAWN—HOT FINISHED
WELDED—BRASS AND COPPER—ALLOYS

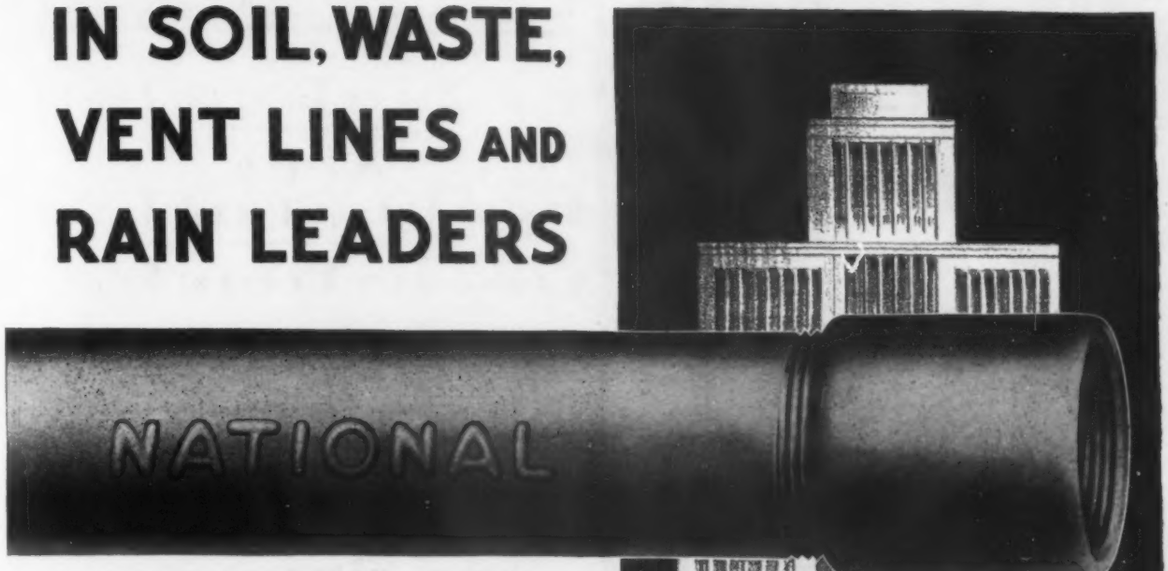
Stock and mill shipment

THE CLEVELAND TOOL AND SUPPLY COMPANY

1427-1437 West 6th Street Cleveland, Ohio

RESISTS CORROSION

IN SOIL, WASTE, VENT LINES AND RAIN LEADERS



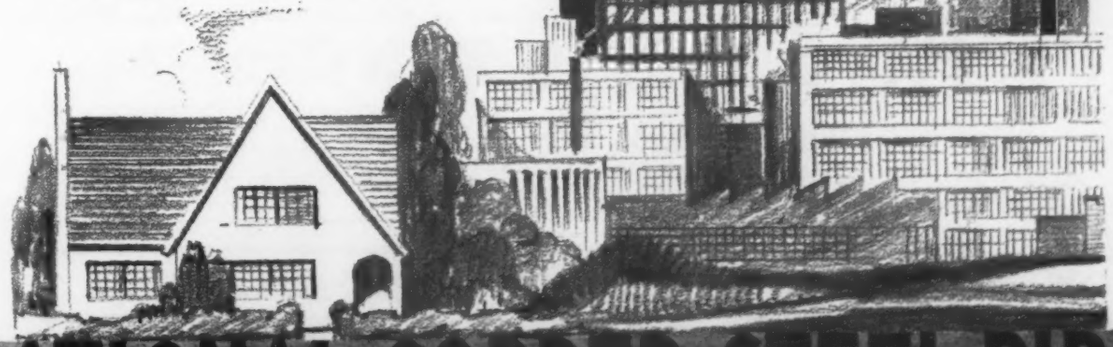
COPPER-STEEL PIPE

IT is a known fact that a considerable portion of the piping used in such lines as soil, waste, vent lines and rain leaders in large buildings, factories and homes is exposed to conditions which approximate atmospheric corrosion. For all such purposes, NATIONAL Copper-Steel Pipe should be used to secure greater protection.

From the standpoint of economy, Copper-Steel Pipe offers the least expensive means of increasing the life of the pipe. Your judgment in installing this product will be backed by nearly twenty years of accumulated evidence that copper-steel adds years of extra life wherever piping is exposed to alternate wet and dry conditions. Ask for Bulletin No. 11, describing—

NATIONAL COPPER-STEEL PIPE
The Original Copper-Steel Pipe

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of United States Steel Corporation



NATIONAL COPPER-STEEL PIPE

MICHIGAN

WELDED STEEL TUBING
and
Tubular Products
for
Every Purpose
¼" to 4" Dia.-10 to 22 Gauge
Made in Any Shape

MICHIGAN
STEEL TUBE PRODUCTS COMPANY
Buffalo St. Detroit, Mich.

The TYLER Tube & Pipe Co.
Washington, Pa.

O. H. STEEL BOILER TUBES

ARMCO
INGOT IRON BOILER TUBES

COP-R-LOY BOILER TUBES

Warehouse Stock

Boiler Tube Co. of America, Pittsburgh, Pa.—Brooklyn, N. Y.
Avery & Saul Co., Boston, Mass.
Beals, McCarthy & Rogers, Inc., Buffalo, N. Y.
John McKenzie & Co., Baltimore, Md.
Tidewater Supply Co., Norfolk, Va.—Columbia, S. C.
Jos. T. Ryerson & Son, Inc., Cincinnati, Ohio
Lukens Steel Co., New Orleans, La.
Young & Vann Supply Co., Birmingham, Ala.
McGowin-Lyons Hardware & Supply Co., Mobile, Ala.
A. M. Castle & Co., Chicago—Seattle—San Francisco—Los Angeles
Harrisburg Pipe & Pipe Bending Co. of Texas, Inc., Houston, Texas

Special Representatives

W. M. MacCleary, New York, N. Y.
W. H. S. Bateman & Co., Philadelphia, Pa.
Denyven, Linn Co., Boston, Mass.
Peter A. Bauer, Buffalo, N. Y.
J. R. Edwards, Erie, Pa.
J. F. Corlett & Co., Cleveland, Ohio
Harrisburg Supply Co., Tulsa, Okla.

TRADE MARK
REG. U.S. PAT. OFF.

Seamless Tubing of Steel, Brass, Copper, Aluminum Nickel-Silver

Specialists in Precision and Hypodermic Needle Tubing

Tubing by Summerill

Manufacturers and Warehousers, Aircraft, Steels, also Commercial Steel

Summerill Tubing Company
Bridgeport, Montg. Co., Pa.
(Phila. District)

SEAMLESS TUBING—lengths and coils

Quick Delivery from Stock

WOLVERINE TUBE CO.
SEAMLESS COPPER BRASS & ALUMINUM
1425 Central Ave Detroit, Mich.

Write for price list

BOILER TUBES
"TONCAN" Seamless Iron
Seamless Steel—Charcoal Iron—Lapwelded Steel
Marine and Stay Tubes
E. F. KEATING CO.
446-454 Water St. New York City
Complete Warehouse Stocks

TUBING STEEL BRASS COPPER
Over 1,000,000 feet in stock available for immediate shipment
SERVICE STEEL CO.

19 Scott Street	Stock List	216 N. Alameda St.
BUFFALO	sent on application	LOS ANGELES
32 E. Front St.	1435 Franklin St.	1106 Post St.
CINCINNATI	DETROIT	SEATTLE

ZINC 99.98 + % *Pure*
ANACONDA ELECTROLYTIC
SALES AGENTS
UNITED METALS SELLING CO.
25 BROADWAY NEW YORK

SEAMLESS & WELDED STEEL TUBING
BOILER TUBES
NEW YORK AND PITTSBURGH WAREHOUSE STOCKS AND PROMPT MILL SHIPMENTS
THE H. L. WANDERMAN CO.
1440 BROADWAY NEW YORK CITY

ZINC
COLD ROLLED, COILS AND STRIPS
FOR STAMPING AND DRAWING
ZINC STRIP FOR ELECTRIC FUSES
Also Manufacturers of EYELETS
The Platt Bros. & Co., Waterbury, Conn.

1878

SEYMOUR
NICKEL SILVER
PHOSPHOR BRONZE
SHEETS-WIRE-RODS
NICKEL ANODES
CAST OR ROLLED

The SEYMOUR MANUFACTURING CO.
SEYMOUR
CONNECTICUT
EST. 1878

1930

WEIRTON

PRODUCERS OF
Pig Iron
Open Hearth Steel
Billets—Slabs—Sheet Bars—Skelp
Coke Tin Plate
Tin Mill Black Plate
Hot and Cold Rolled Strip Steel
and
Strip Steel Sheets
Galvanized, Black and Blue Annealed Sheets.
Single Pickled, Full Pickled and Auto Body Sheets

WEIRTON STEEL CO.
WEIRTON, W. VA.
Division of National Steel Corporation
Sales Offices in All Principal Cities

SAVE WITH STEEL

Chateaugay All Ore Pig Iron
IS
CHEMICALLY and PHYSICALLY QUALIFIED
For Making
BETTER
STEEL AND GREY IRON CASTINGS
IT IS GUARANTEED
PHOS. and SUL. .03 MAXIMUM
E. J. BURNES, General Sales Agent
CHATEAUGAY ORE & IRON CO.
26 Liberty Street, New York

ALAN WOOD STEEL CO. ESTABLISHED 1826 "A.W." TRADE MARK CONSHOHOCKEN, PA.

"A.W." PRODUCTS

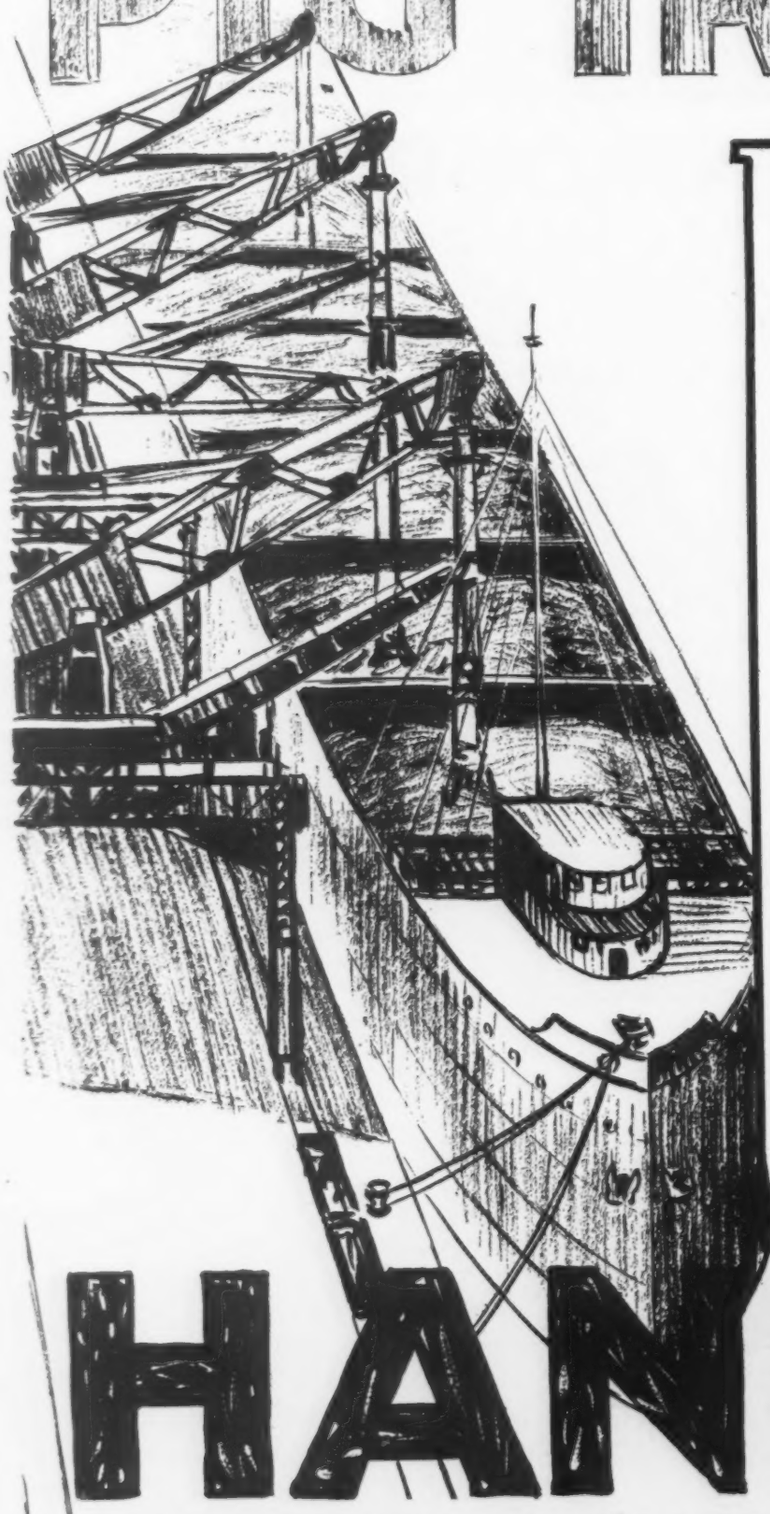
"Swede" Pig Iron
*"A.W." Billets, Blooms and Slabs
*"A.W." Sheared Steel Plates
*"A.W." Blue Annealed Sheets and Light Plates
*"A.W." Diamond Pattern Floor Plate
*"A.W." Diamondette Pattern Floor Plate
*"A.W." Diamond Pattern Traffic Treads

*Copper-Bearing, Alloy and Carbon Analyses

Write for a copy of the "A.W." Catalog, containing complete data on "A.W." Products.

ALAN WOOD STEEL CO.
Conshohocken, Pa.
Philadelphia Seattle New York San Francisco Boston Los Angeles Dallas

PIG IRON



A HANNA customer is not merely a name on our books. He is an important part of our organization. His special needs, difficulties, and emergency requirements are our concern also, and receive our prompt and whole-hearted attention.

That is HANNA service—a service that was over a century in the making—a service that doesn't cost you a penny! You are invited to use it.

BRANDS:
Buffalo ~ Detroit
Susquehanna
Hanna Silvery
Ferro Silicon

GRADES:
Foundry ~
strong or soft
Malleable ~
all grades of analysis

ALSO COAL:
Anthracite
Bituminous

HANNA

THE HANNA FURNACE CORPORATION

Merchant Pig Iron Division of National Steel Corp.
2524 Union Trust Building
DETROIT, MICH.

Hillman Coal & Coke Company

First National Bank Building, Pittsburgh, Pa.

New York, Whitehall Bldg. Philadelphia, Pennsylvania Bldg.
Baltimore, Continental Bldg.

Standard Low Sulphur Connellsville Coke

for Blast Furnaces and Foundries

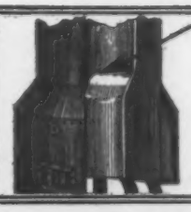
SHIPMENTS 3,000,000 TONS ANNUALLY
Daily Shipments 10,000 Tons. Any Railroad Delivery.

PILLING & COMPANY
PHILADELPHIA BOSTON NEW YORK PITTSBURGH Inc.
Pig Iron
Iron Ores
Alloys
Coal
Coke

FIRE BRICK
FOR ALL NEEDS
NORTH AMERICAN REFRACTORIES COMPANY
General Offices: National City Building, Cleveland, Ohio
Sales Offices:
Boston, New York, Philadelphia, Pittsburgh, Buffalo, Chicago, St. Louis.
Hamilton, Ont., Can., North American Refractories, Ltd., 20 Jarvis Street

---

IRON ORE · PIG IRON
COAL TRADE C I C MARK **COKE**
The Cleveland-Cliffs Iron Co.
CLEVELAND, OHIO.



Mica Schist Lining Fuses Into One Piece

MICA SCHIST will appeal to you for two simple reasons.
1. It is a natural refractory, in large blocks which readily fuse together. Expansion is nil. Slag will not adhere to it.
2. Low costs of material, installation and maintenance result in large savings. Shipped in bulk per ton taking the low rate.

EDGE HILL SILICA ROCK CO.
NEW BRUNSWICK, N. J.

The Shenango Furnace Company

Lake Superior Iron Ores
Bessemer, Non-Bessemer, Aluminiferous

Shenango Pig Iron
Bessemer, Basic, Malleable, Foundry

THE S F Co.

Coal and Coke

OLIVER BLDG., PITTSBURGH UNION TRUST BLDG., CLEVELAND

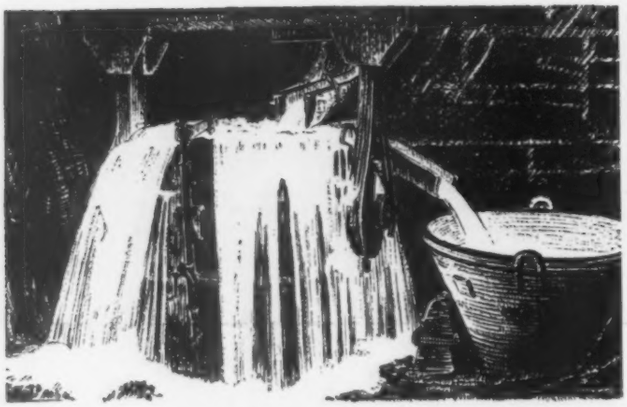
ROGERS BROWN & CROCKER BROS., INC.

Ferro-Phosphorus
Ferro-Silicon
Spiegeleisen
Fluor Spar

COKE — PIG IRON — FERRO-MANGANESE
21 East 40th St., New York, N. Y.
Cincinnati Buffalo Philadelphia Boston Pittsburgh Cleveland Chicago St. Louis

Aluminum
Nichrome B
Smithing Coal
Molding Sand

500,000 Tons of Steel Deoxidized with ALSIFER



ALSIFER, the deoxidizer without a disadvantage, was introduced to the steel industry little more than a year ago and since that time approximately 500,000 tons of steel have been deoxidized with ALSIFER.

Such acceptance of ALSIFER as an essential in present-day melting practice is ample proof of the fact that ALSIFER provides more efficient deoxidation, giving greater uniformity in melts of the same chemical composition, assuring freedom from non-metallic inclusions and improving the quality of the product.

To those who are not familiar with the advantages that accompany the use of ALSIFER *for final deoxidation, complete data will be gladly sent. Write us.*

VANADIUM CORPORATION OF AMERICA
120 BROADWAY, NEW YORK, N. Y.
CHICAGO *Straus Bldg.* PITTSBURGH *Oliver Bldg.* DETROIT *Book Tower*
Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
Research and Development Laboratories at Bridgeville, Pa.

VANCORAM BRAND

FERRO ALLOYS

Ferro-Vanadium
Ferro-Silicon
Ferro-Chromium
Silico-Manganese
All Grades
Tungsten
Molybdenum

The Howe-Fuller Refractories Co.
ALL REFRACTORY MATERIAL
Silica, Fire Clay, Chrome, Magnesite Brick
All Grades Fire Clay and Refractory Cements
Offices: 2008 Union Trust Bldg., CLEVELAND, OHIO.

J. E. BAKER COMPANY
YORK, PA.
35 Years' Experience
MAGDOLITE — LOW SILICA LIMESTONE
DOLOMITE—WHITING—CHEMICAL LIME

GENERAL REFRACTORIES COMPANY
106 So. 16th St., Philadelphia, Pa.
REFRACTORIES
Fire Clay, Silica, Chrome, Magnesite, High Alumina
Acid-Proof Brick, High-Temperature Cements
Branches: Buffalo, Chicago, Cleveland, Detroit, Indianapolis, New York, Pittsburgh, Boston, St. Louis, San Francisco, Seattle, Montreal, Havana, Cuba.

THE CHAS. TAYLOR SONS COMPANY
Manufacturers of High Grade Refractories for 62 Years.
TIGER STEEL—Made from Kentucky fire clays.
TAYCO—The famous high-alumina special refractory brick.
P. B. SILLIMANITE—A super-refractory for the most severe furnace conditions.
We can help you with your most difficult furnace problems. Inquiries are solicited.
GENERAL OFFICE—CINCINNATI, OHIO

CHROME ORES — **"LAVINO" FERRO-MANGANESE** — **CHROME BRICK**
E. J. LAVINO AND COMPANY
CHICAGO PHILADELPHIA PITTSBURGH

NIAGARA BRAND

FERRO-SILICON
Ferro-Manganese Ferro-Chrome
Silico-Manganese Silico-Aluminum
PITTSBURGH METALLURGICAL CO., INC.
PLANT and MAIN OFFICE — NIAGARA FALLS, N. Y.

THAT INDEFINABLE SOMETHING

In Their Straight Edges, Sharp Corners and Exceptional Uniformity

THERE'S A PROMISE OF LONG SERVICE

ABOUT every well-made product there is an indefinable something that wins your confidence. You may not be able to detail your reasons but you just *know* that the well-made article will give long service.

This reaction is particularly true of refractories. Pick up a Harbison-Walker firebrick. Examine it carefully. Note the clean, straight edges and sharp corners . . . the absence of surface defects and blemishes . . . the uniform burn. Break the brick. Study the two halves, the texture, the exceptional uniformity, the freedom from laminations. Back of all these is the right analysis. Immediately, you say to yourself, "Here is good brick. It will give long and satisfactory service in open hearths, blast furnaces and other refractories applications."

And your judgment will be right. For, Harbison-Walker brick is good brick. Those straight edges and sharp corners are indicative of improved methods of power pressing. That characteristic uniformity of burn is the result of better kilns and pyrometric control. The texture is evidence of the highest grades of raw materials and better grinding and blending.

Send for some specimen Harbison-Walker brick. If you know refractories you will find real pleasure in the mere handling of brick so exceptionally uniform.

HARBISON-WALKER REFRACTORIES COMPANY

World's Largest Producer of Refractories

PITTSBURGH, PENNSYLVANIA

OFFICES IN PRINCIPAL CITIES

Frank Samuel S. A. Cochran Snowden Samuel

FRANK SAMUEL & CO.

Harrison Bldg., Philadelphia, Pa.

80% **FERRO-MANGANESE** ENGLISH
ENGLISH LOW PHOS. **PIG IRON** FRENCH FOUNDRY
MUCK BARS
LOW PHOS. & STAYBOLT AMERICAN SWEDO IRON CO.'S
MANGANESE ORE
OPEN HEARTH USE BLAST FURNACE USE
IRON ORES
AFRICAN LUMP **CHROME ORE** SAMCO GROUND

Branch Offices:
39 Cortland St., New York .. 24 Alban Road, Boston, Mass.

Made by the Largest Individual Manufacturer of Weldless Rings

MILWAUKEE WELDLESS RINGS

We are pioneer manufacturers of Weldless Roll Steel Rings of any analysis steel. Our rings are rolled unusually close to the finished size, a point that is appreciated by manufacturers who wish to save on material and labor costs. Write for quotations.

Rolled Close to Size

MILWAUKEE FORGE & MACHINE CO.
340 E. OKLAHOMA AVE., MILWAUKEE, WIS.

Walter-Wallingford & Co.

50% Ferro Silicon
Ferro Manganese
Chrome Ore
Pig Iron
CINCINNATI

20% to 25%
Ferro Phosphorus
Spiegeleisen
Iron Ore
Coke
CHICAGO

Light and Medium Weight High Grade Forgings made of Tool Steels, Alloyed Steels, Open Hearth Machinery Steels

Forgings

DIEMAKERS FORGINGS, GEAR BLANKS, CRANKSHAFTS, PISTON RODS, LEVERS, ROLLS, SPINDLES, WELDLESS RINGS and SHAPED WORK

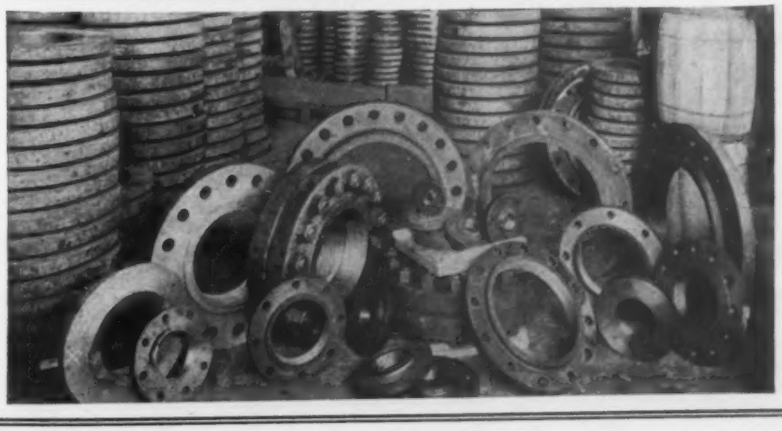
VULCAN STEAM FORGING CO.
Rano Street, Buffalo, N.Y.

FORGINGS
Railroad, Automobile, Tractor, Miscellaneous Drop and Upset
SHEAR KNIVES
Solid Hammered Crucible Tool Steel Blades
Cast Steel Blades for Slab Mill Shears
PITTSBURGH FORGINGS COMPANY
OFFICE AND WORKS, CORAOPOLIS, PA.

NATIONAL FORGE & ORDNANCE CO.
Irvine (Warren Co.), Pa.
Manufacturers of high grade Forgings.
Hollow bored, rough or finished complete.
Bell Phone: 55 Youngsville, Pa.
Branch Offices:
CHICAGO CLEVELAND NEW YORK DETROIT

Electric Welded Rings and Bands
Rough or Machined
In a wide range of sizes and shapes
THE AMERICAN WELDING & MFG. CO.
WARREN OHIO

FORGINGS · HARDTEM DIE BLOCKS
KLEENKUT SHEAR KNIVES
HEPPENSTALL COMPANY
PITTSBURGH, PA. *BRANCHES IN PRINCIPAL CITIES*



CANN & SAUL STEEL CO.

FORGED STEEL
PIPE FLANGES
ANY SIZE ALL TYPES
STOCK SHIPMENTS

516 COMMERCE ST., PHILA., PA.
Works—Royersford, Pa.

STEEL & IRON FORGINGS

SHAFTS - RINGS - GEAR BLANKS - MISCELLANEOUS SHAPES

FORGED STEEL PIPE FLANGES

LOW HUB - HIGH HUB - REDUCING - WELDING - SPECIAL - SHIPMENTS FROM STOCK

PHILADELPHIA STEEL & IRON CO.

COMMERCIAL TRUST BUILDING
PHILADELPHIA, PA.

Hammered Forgings

The Machinery Forging Co.
Cleveland
INCORPORATED 1902

DROP FORGINGS

Always the same HIGH QUALITY—delivered when and as you order them.

U. S. BODY & FORGING CO., INC.
BUFFALO, N. Y.

WELDLESS STEEL RINGS

GEAR, BEARING AND MISCELLANEOUS ROLLED RINGS

SIZES 5" TO 160" OUTSIDE DIA. AND UP TO 48" WIDE

EDGEWATER STEEL CO., PITTSBURGH, PA.

THE DROP FORGING CO. of NEW YORK

Steel *Brass* *Copper* *Monel Metal*

TRADE Σ MARK

DROP FORGINGS TO ORDER

301 West Side Avenue, Jersey City, New Jersey

The CLEVELAND HARDWARE CO.

CLEVELAND, OHIO.
FORGINGS, STAMPINGS *and* FABRICATED STEEL

DROP FORGINGS FROM SMALLEST TO LARGEST

Upset and Machined Forgings
TRUCK, AUTOMOBILE, CAR AND GENERAL FORGINGS

CANTON FORGE & AXLE COMPANY
2005-2039 DUEBER AVE., S. W., CANTON, OHIO

WE SPECIALIZE ON
SMALL DROP FORGINGS

Plants centrally located and specially equipped to manufacture high quality drop forgings, up to 6 lbs.

40 years' experience

THE QUEEN CITY FORGING CO.
235 Tennyson St. CINCINNATI, OHIO

Drop Forgings

of the Highest Quality

THE D. WILCOX MANUFACTURING CO.
MECHANICSBURG, PA.

DROP FORGINGS

OF THE HIGHEST QUALITY in steel and brass. SMALL AND MEDIUM SIZES.

KEYSTONE FORGING CO., Northumberland, Pa.

INDIANAPOLIS DROP FORGING Co.

MANUFACTURERS OF DROP FORGINGS

Established 1897

INDIANAPOLIS, 1300 MADISON AVENUE INDIANA

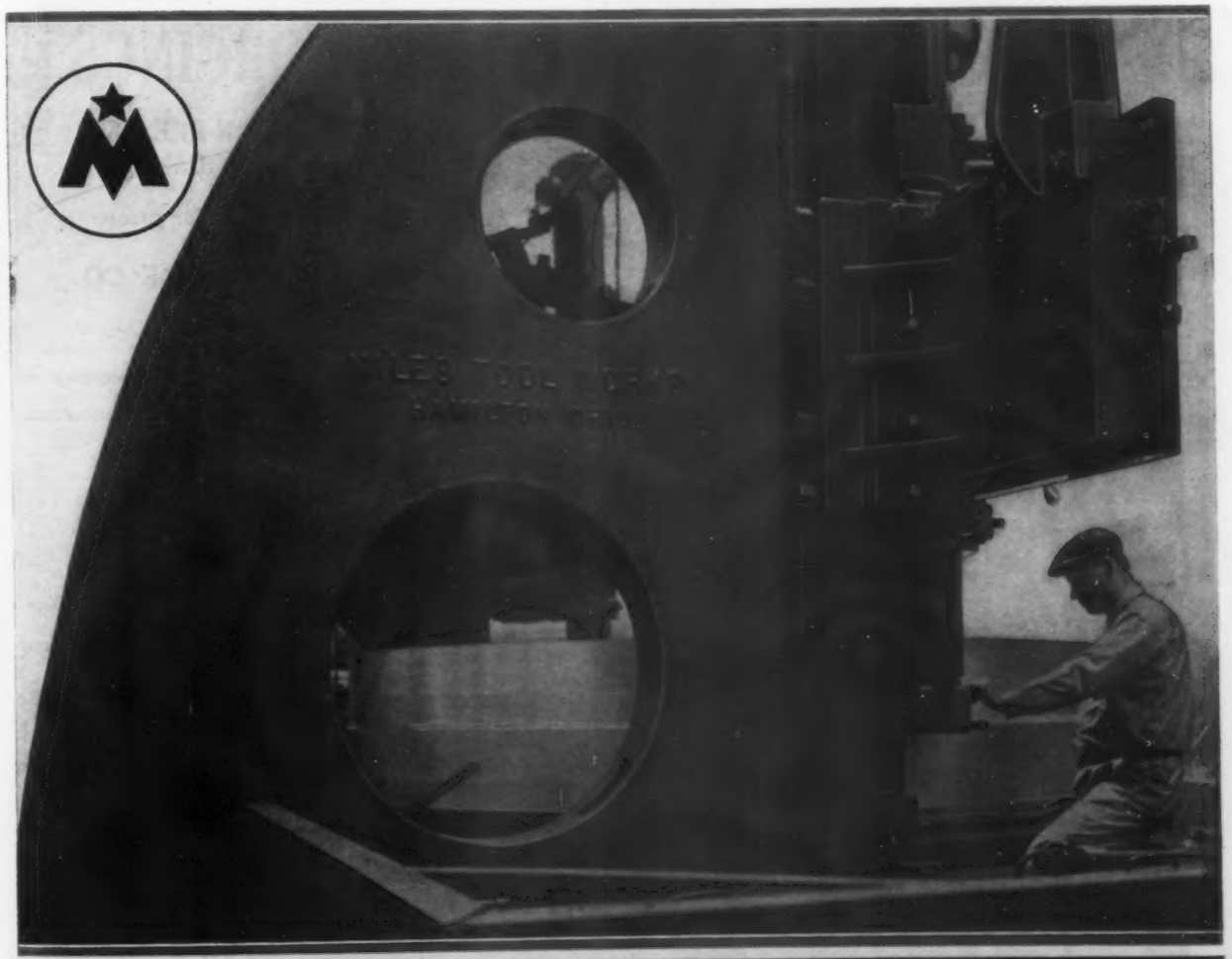
UNUSUAL DEMANDS COME TO MIDVALE

Many unusual demands come to The Midvale Company from day to day . . . demands for forgings and castings of tremendous size—products that require intricate machining and at the same time demand abnormal strength and reliability.

Midvale has kept apace with present day demands by installing many new tools and adding much new machining equipment to adequately meet all modern exactions. Three 90-inch vertical boring mills, a 20-inch by 18 feet cylindrical grinder, a jig borer and a 110-inch cold saw—the world's largest—are all recent additions to Midvale machine shop equipment.

Our eight machine shops have for many years enjoyed a reputation for fine precision work—a reputation gained in the close tolerances of United States Ordnance manufacture and now maintained on a wide variety of commercial work. At the present time Midvale is machining—to nth degree accuracy—castings and forgings that range in size from a 120-ton pressure cylinder down to extremely small jigs weighing but a few ounces.

Midvale is equipped to serve your metal needs, whether it is for large, small or medium sized work. Consult us about your requirements and we will help solve your problems. The Midvale Company, Nicetown, Philadelphia; District Offices: New York, Washington, Pittsburgh, Cleveland, Chicago and San Francisco.



MIDVALE

US UNION SWITCH

DROP and UPSET
FORGINGS

—any size weighing 500 lbs. and under—any analysis—any heat treatment—any quantity—moderately priced—prompt deliveries.

Monthly capacity 2,500 tons.

UNION SWITCH & SIGNAL CO.
DROP FORGE DIVISION
PITTSBURGH DISTRICT SWISSVALE, PA.

ATLAS

Drop Forging Engineering and Manufacturing since 1906. A Distinguished Service Record.
All trained and experienced men to handle your work correctly.
Wide range of equipment, Hammers, Upsetters and Hydraulic Machinery. Finest Heat Treating facilities.
Your specifications strictly adhered to. No charge for Engineering Service.

ATLAS DROP FORGE CO., LANSING, MICH.

STEEL FORGINGS

UPSET, DROP and COIN PRESSED
ANY ANALYSIS—ANY QUANTITY

Send us your blue prints for prices

ROCKFORD DROP FORGE CO.
ROCKFORD, ILL.

DROP-FORGINGS
any shape
any material
any size to 350 lbs

UP-TO-DATE FACILITIES
LABORATORY
HEAT-TREATING
SAND BLASTING

J·H·WILLIAMS & CO·
"The Drop-Forging People"
BUFFALO
NEW YORK CHICAGO

1864 DROP FORGINGS 1930
AUTOMOBILE CARRIAGE SPECIAL
We specialize in forgings of nickel steel, chrome nickel, vanadium tool, open hearth, Bessemer steel and Norway iron. Estimates furnished and deliveries made promptly. We are well equipped to heat-treat and machine forgings.
THE E. D. CLAPP MANUFACTURING CO.
86 Columbus St., Auburn, N. Y.

DROP FORGINGS
TOOLS, MACHINED PARTS
HENRY FORGE & TOOL, INC.
AUBURN N.Y.
QUALITY-SERVICE OUR GUARANTEE

STORMS
DROP FORGING COMPANY
Quality Drop Forgings of Steel, Bronze, Stainless Iron, Monel Metal and Aluminum
700 PAGE BOULEVARD
SPRINGFIELD, MASS.

SPECIAL ALLOY CASTINGS
to resist OXIDATION, CORROSION, ABRASION
Modern equipment—Expert Metallurgical staff.
We solicit your inquiries.
NATIONAL ALLOY STEEL CO.
BLAWNOX, PA.

ASF
Steel castings of every description ~ Inquiries solicited
AMERICAN STEEL FOUNDRIES
Address all communications to Dept. M.
Room 1684 Wrigley Bldg. Chicago

JOYCE-CRIDLAND JACK

Castings by COMMERCIAL

A Joyce High Speed Self Lowering Jack, upright type, 50 to 100-ton capacity. One of the many types of jacks and lifts manufactured by the Joyce-Cridland Company, Dayton, Ohio

Since 1873 the Joyce-Cridland Company have been outstanding manufacturers of high grade hoists, jacks, and lifts for every purpose. The tremendous lifting power of Joyce Jacks makes it absolutely essential that castings used in their manufacture are able to withstand terrific weights and strains.

The main castings for Joyce High Speed Jacks are made by The Commercial Steel Castings Company. To pass the rigid requirements of this type of work castings must be of high grade steel, perfectly cast, skillfully made, and free from imperfections. Ability to withstand cross-strains and extraordinary weight is imperative. Commercial Steel Castings have proven very satisfactory.

THE COMMERCIAL STEEL CASTING CO.

Subsidiary of The Osgood Company

MARION, OHIO

Sales Offices

416 First National Bank Bldg.
Cincinnati, Ohio

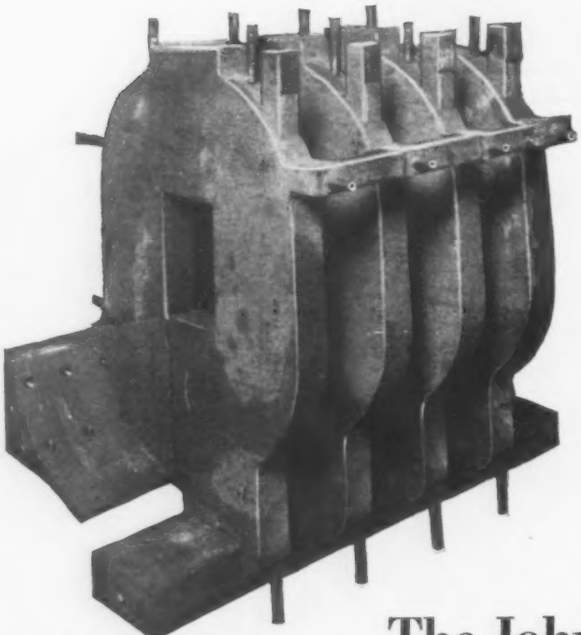
1002 Tribune Bldg.
New York City

1623 Conway Bldg.
Chicago, Ill.

Fisher Bldg.
Detroit, Mich.

620 National Bldg.
Cleveland, Ohio

4500 POUNDS OF PUREST COPPER
To Make ONE Secondary Casting



That was the story on this giant casting we recently made for The Swift Electric Welder Company of Detroit, Michigan. There were four such castings on a welder they have just produced having a total KVA rating of 4,800. The iron pipes shown in the photo are cast into the copper casting.

This welder is capable of welding a 56" pipe casing with a 5/8" wall thickness. This is a splendid example of the present-day trend in welding design to a larger type secondary casting.

If your casting requirements demand Quality workmanship, such as is evident in this casting, we will gladly quote detailed prices, and show you further the excellent type of work we are doing for our many clients. Of course, this places you under no obligation. . . . Quality castings under 5,000 lbs.

Pure Copper Castings.
Acid Resisting Castings.
Manganese Bronze.
Aluminum Bronze for Welding Dies.
Aluminum Alloy Castings.

The John Harsch Bronze & Fdry. Co.
11612 Madison Ave., Cleveland, Ohio

OPEN HEARTH
STEEL CASTINGS
and
Hammered and Steam Hydraulic
PRESSED FORGINGS
Large Capacity Prompt Shipments
ERIE FORGE CO.
ERIE, PA.

AMSCO
Shock Resistant
AMERICAN MANGANESE STEEL COMPANY
375 E. 14th Street, Chicago Heights, Ill.

Atlas Steel Casting Company
General Office and Works: Buffalo, N. Y.
30 E. 42nd St., New York
Acid Open Hearth Steel Castings Exclusively

DUQUESNE STEEL FOUNDRY CO.
STEEL CASTINGS
for Every Purpose
Pittsburgh, Pa.

Strong Steel Foundry Co.
Acid open-hearth steel
Buffalo, N. Y.
TENSILE STRENGTH ELONGATION

ASF
Steel castings of every description ~ Inquiries solicited
AMERICAN STEEL FOUNDRIES
Address all communications to Dept. M.
Room 1684 Wrigley Bldg. Chicago

MANGANESE STEEL CASTINGS
THE FROG, SWITCH & MFG. CO.
ESTABLISHED 1881 CARLISLE, PA.

From a Pound to a Ton — **ELECTRIC STEEL CASTINGS** — Inquiries Solicited
CRUCIBLE STEEL CASTINGS COMPANY
LANSDOWNE, DELAWARE COUNTY, PENNSYLVANIA
(Near Philadelphia)

ELECTRIC STEEL CASTINGS
Carbon Steel. Also Alloys chrome, nickel, vanadium. Modern plant. Good service.
CRUCIBLE STEEL CASTING CO.
CLEVELAND, OHIO

CASTEEL — *Immediate Delivery*
Small Electric Steel Castings
CALUMET ELECTRIC CASTEEL CO.
Summer Boulevard - - Hammond, Indiana

MAYNARD ELECTRIC STEEL CASTING COMPANY
Electric steel castings from 1 to 10,000 lbs. each
1-11 Kilbourn Road Milwaukee, Wis.

ELECTRIC STEEL CASTINGS
From ¼ to 2000 lbs. in Quantities
The INDUSTRIAL STEEL CASTING CO.
TOLEDO, OHIO

The Cincinnati Steel Castings Co.
Manufacturers of
ELECTRIC STEEL CASTINGS
SPECIAL STEEL
Vanadium Chrome Case-Hardening Motor-Steel Nickel Steel
Spring Grove, Alabama and Bates Aves., Cincinnati, O.

MALLEABLE IRON CASTINGS
NEWARK MALLEABLE IRON WORKS
QUALITY NEWARK, N.J. SERVICE

SMALL ELECTRIC STEEL CASTINGS
(Capacity 500 Tons per Month)
THE WEST STEEL CASTING CO.
CLEVELAND OHIO, U. S. A.
"He Profits Most Who Serves Best" *Better Steel Castings*

NR
Malleable Castings
of GUARANTEED QUALITY
for Railroad, Agricultural Implement and Automobile Requirements
NORTHERN MALLEABLE IRON CO.
ST. PAUL, MINN.

TREADWELL
ELECTRIC FURNACE
STEEL CASTINGS UP TO 6000 LBS.
Any Carbon or Alloy
High Pressure Castings a Specialty
TREADWELL ENGINEERING CO.
EASTON PENNSYLVANIA

PEORIA
Malleable Castings Co., Peoria, Ill.
Castings of Guaranteed Quality
Peoria Detachable Sprocket Chain
Prompt Service and Shipments
CERTIFIED MALLEABLE CASTINGS

ELECTRIC
STEEL CASTINGS
Service Quality
GEO. H. SMITH STEEL CASTING CO.
MILWAUKEE, WIS.
Chicago Office: 549 W. Washington Blvd.

Richmond malleable castings
RICHMOND MALLEABLE CASTINGS CO., RICHMOND, INDIANA

MACHINED CASTINGS OUR SPECIALTY
Malleable and Gray Iron Fittings for Oil, Gas, Water, Steam, Air Brake
TANK FITTINGS—OIL EQUIPMENT AND SERVICE STATION FITTINGS
STANLEY G. FLAGG & CO., INC.
OFFICE: MORRIS BLDG., PHILADELPHIA, PA. WORKS: STOWE, PA.

GRAY IRON CASTINGS

We Specialize in

FINE SMALL HARDWARE CASTINGS
INGOT MOLDS FOR BRASS AND COPPER
MANHOLE FRAMES AND COVERS
BUILDING CASTINGS
GENERAL MACHINERY CASTINGS
up to 30 Tons each

THE SESSIONS FOUNDRY CO.

Bristol *Established* 1879 Conn.

Semi-Steel Malleable Iron
Nickel and Vanadium
Low and Special
Carbon Steel

CASTINGS—*to suit your needs exactly*

Our facilities and 64 years of experience are at your service, assuring you of high grade castings together with prompt deliveries.

MALLEABLE IRON FITTINGS CO.
BRANFORD, CONN.

DIFFICULT GREY IRON CASTINGS

SMALL AND MEDIUM SIZES

In every casting we produce —QUALITY is first—price secondary. Dependable castings reduce rejections to a minimum, thereby resulting in greater savings over lower quality castings.

To those who use difficult and unusual castings, and consider QUALITY first—all we ask is a trial.

THE XENIA FOUNDRY and MACHINE CO.
XENIA "Yours For Better Castings" OHIO

Light Weight
CERTIFIED MALLEABLE CASTINGS
MEEKER FOUNDRY CO.
Malleable Founders for 85 Years
Clay Street Newark, N. J.

I. S. Spencer's Sons
INC.
Guilford, Conn.
Manufacturers of Light Grey Iron, Brass and Bronze Castings
Patented Articles
General Hardware
Screw Machine Products
Polishing & Plating

MALLEABLE IRON CASTINGS
Quality and Quantity Producers
VERMILION MALLEABLE IRON CO.
Manufacturers of
CERTIFIED MALLEABLE IRON
0161 Railway Exchange Bldg. CHICAGO HOOPERSTON 202 N. Sixth Ave. ILLINOIS

If It's
BRASS, BRONZE OR COPPER
CASTINGS
CONSULT
LUMEN BEARING CO.
BUFFALO, NEW YORK

FITTING EVERY-DAY HOME UTILITIES *to the average housewife's pocketbook*

PRODUCTION economies brought about by Stewart Die-Casting measurably reduce costs, give added strength and finish.

Stewart engineers take a complicated machine tooled part, simplify its design, prescribe a test proof alloy, and apply the die-casting process. Aluminum ware, once sand-cast, is die-cast to an even thickness, possesses greater strength and finer finish. A complete vacuum cleaner housing is produced in two halves, measurably reducing its cost without sacrifice of quality.

Frequently one Stewart casting replaces an entire sub-assembly, so expert are Stewart specialists in the application of products to production as die-castings. Behind this process stands a complete staff of engineers, metallurgists, craftsmen, and modern machinery, ready to serve you.

A word from you brings a Stewart engineer to give personal attention in regard to your die-casting requirements, or why not send blue prints or samples for quotations today?

Detroit
Pittsburgh
Dayton
St. Louis
Newark
Cleveland

Stewart

THE STEWART DIE-CASTING CORPORATION

4500 Fullerton Avenue, Chicago, Illinois

Our new "Engineer's Die Casting Handbook" is now ready. It contains a brief, factual description of the die casting process in all of its modern developments. Write for your copy today.

WORCESTER STAMPED METAL ©
· QUALITY · STAMPINGS

Good Will and Good Work

It is sometimes our good fortune to convert an expense into a saving. Expensive castings are sometimes used when instead they should be stamped and pressed. We have demonstrated the superiority of the stamped piece over the casting in many instances. That was good work. The good will was a natural sequence—so also were the repeat orders.

Perhaps we can also serve you to save. We do anything that can be done in sheet metal work from steel, copper, aluminum and brass.

WORCESTER STAMPED METAL COMPANY

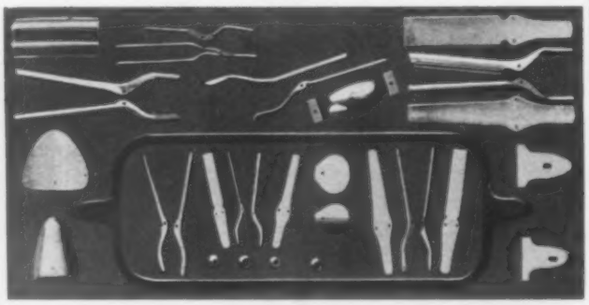
Successors to W. & S. Mfg. Co.
Established 1883

Worcester, Massachusetts

Philadelphia Representative:
H. L. HESS CO., 2106 West Atlantic St.

Let us quote.... on STAMPINGS

We illustrate a few stampings which suggest the large variety which we can produce for you—at a saving. Most favorable labor and market conditions permit us to offer attractive quotations and prompt service.



Complete Tool Room, Stamping, Plating and Lacquering Departments available. Our reputation for quality Stamping and Finishing work has been in the making for more than fifteen years. Investigate, it may save you money.

PEERLESS NOVELTY COMPANY
Grand Haven, Michigan

STAMPINGS

Replace your small castings with more serviceable—less expensive stampings

We also make WELDED RINGS and BANDS 6″ to 60″

Redevelopment work is one of the principal features of our business. Let us show you the savings we are making for manufacturers in automotive, furniture, and general metal goods lines by replacing small and medium castings with stampings. Lighter weight, better appearance and better prices are only part of the benefit you receive.

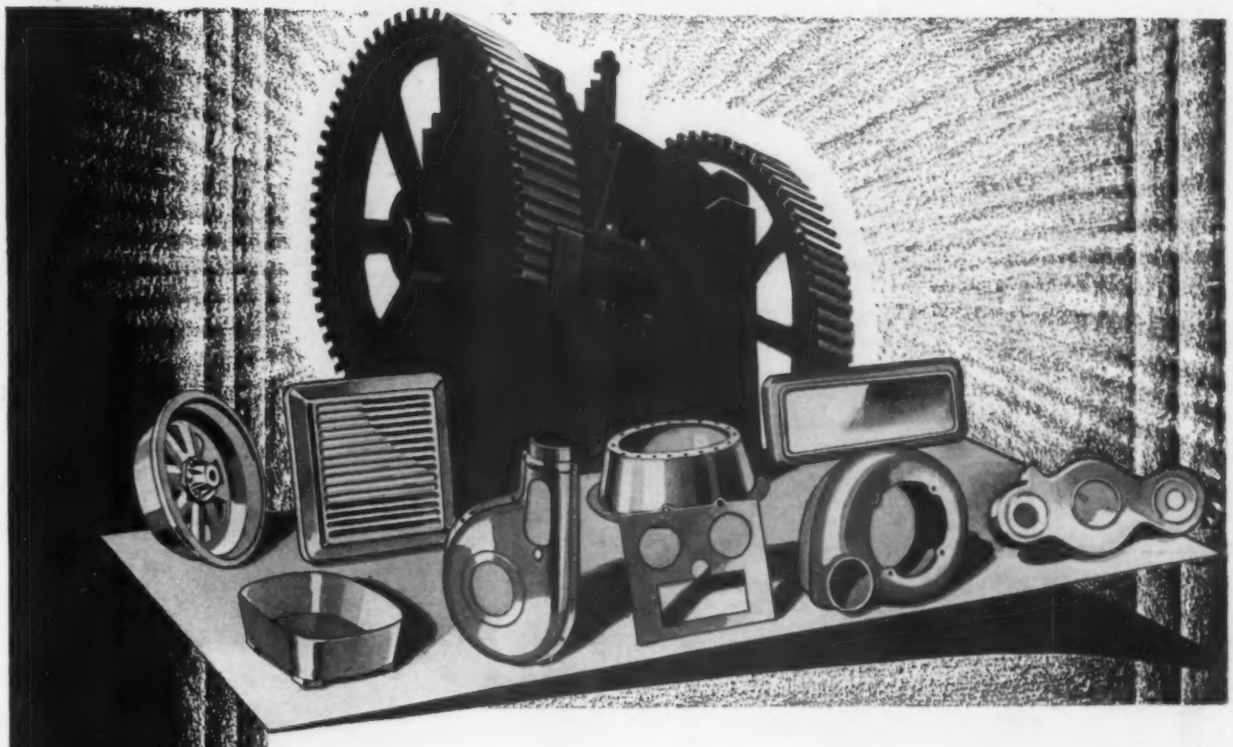
A drawing or sample with the approximate quantity required is all we need.

THE AKRON-SELLE CO.
AKRON OHIO
43 Years in Business

STAMPINGS
GOOD DIES
DETROIT STAMPING CO.
3445-65 W. Fort St., Detroit, Mich.

HEAVY PUNCHINGS
LIGHT STAMPINGS
Washers Our Specialty
70 years Assortment of Punches and Dies enables us to furnish variety of Washers without tool charges.
THOMAS SMITH CO.
286 Grove St., Worcester, Mass.

STAMPINGS THAT IMPROVE YOUR PRODUCT
Better stampings mean a better product, lower assembly costs, and a big saving in time. Write.
MAKERS OF "TROUBLE-FREE" STAMPINGS
New England Pressed Steel Co.
1 Washington Ave., Natick, Mass.



Flat Rolled Steel and Powerful Presses .... have saved many concerns

THE advent of the pressed steel engineer has meant the innovation of new manufacturing methods, big reductions in material, production and handling costs — stronger, lighter, better looking products for many companies.

His duties are to study your products, discover if they need and lend themselves to redesign and, if so, make recommendations that will enable you to enjoy the savings and profits made possible by adopting pressed steel.

Pressed steel is cutting production and shipping costs for your competitors — or will in the near future. Study your own products. Call in the pressed steel engineer and ask him — "Can this be made of pressed steel?" Though not an accountant, he can often turn red figures into black.

We shall be glad to put you in touch with men who can give you an accurate estimate of the advantages which you can obtain with pressed steel. If it won't pay you to change they will tell you so frankly.

And while you are thinking of steel — consider the many advantages of steel buildings — saving time, money and supplying more usable space — steel office furniture — saving depreciation and fire loss — steel partitions (toilet and office) which permit speedy erection, easy removal, and provide durability and a decided saving in upkeep. For information just write Trade Research Division, National Association of Flat Rolled Steel Manufacturers, Terminal Tower Building, Cleveland, Ohio.

Steel buildings save money, erection time, upkeep—and provide more usable space.

Save $ Money Labor Time with Pressed Steel

SHUTTER LOUVRES

In any quantity desired. We are in a position at this time to give you an attractive price and prompt delivery.
We also make stamped Louvres with permanent openings to your requirements.

Send Blue Print or Pencil Sketch

THE BREESE BROS. CO.
Cincinnati, Ohio

MAKERS OF
TOTE BOXES—SHOP BOXES
—PICKLING BASKETS

FABRICATORS OF
STEEL—IRON—BRASS—COPPER
—MONEL METAL

Requiring
Stamping—Forming—Drawing
Blanking—Punching

See Data A.S.M.E. Mechanical Catalog
McRae Hendricks and Thomas Catalogues

YORK

STAMPINGS
and
SHEET METAL WORK

Our organization and equipment permit us to guarantee quality product and prompt delivery in any quantity.

Send Blueprint or Samples for Estimate

York Corrugating Company, York, Pa.

"Bridgeport"

STAMPINGS

BRASS
BRONZE · COPPER
AND ALUMINUM

Rough, semi-finished, finished or assembled. Complete engineering service, unlimited facilities for producing and assembling. Send drawings, blue prints, or samples for quotations.

BRIDGEPORT BRASS CO.
BRIDGEPORT, CONN.

SHEET METAL WORK

Small orders solicited
as well as quantity production.

OUR facilities consist of shearing and forming equipment up to 10' and 3/16", large number of presses, spot welders, oxy-acetylene and arc welders, also very complete japanning equipment.

Plant is now specializing in automotive sheet metal work.

Send us drawings or samples for prices.

CHAMPION SHEET METAL CO., Inc.
COR. SQUIRES & DUANE STS.
CORTLAND, NEW YORK

STAMPINGS
Die Makers
THE E. KONIGSLOW STAMPING & TOOL CO.
Cleveland, Ohio.

STEEL STAMPINGS

Flat and Formed Pieces of Medium Size our Specialty
LIGHT WASHERS AND BURRS
JAPANNING, TINNING, ELECTRO PLATING

J. H. SESSIONS & SON BRISTOL, CONN. U. S. A.

Stampings

TOOLS, DIES, TURNING BRASS AND ALUMINUM CASTINGS, GRINDING, POLISHING, PLATE ENAMELING AND ASSEMBLING.

A complete outfit at your service on any of the various operations. Send us your drawings, blue prints or samples for quotations.

DOUGLAS & LOMASON, 5836 Lincoln Ave., Detroit, Mich.

MULLINS for STAMPINGS
(Quality Service & Price)

MULLINS MANUFACTURING CORPORATION
MAIN OFFICE AND WORKS—SALEM, OHIO
in the Pittsburgh and Cleveland district
Chicago: 332 South Michigan Ave. Detroit: 7-252 General Motors Bldg

INDIANA
Pressed Metal
STAMPINGS

INDIANA PRESSED STEEL CO.
Muncie: Indiana

HAGER

WROUGHT STEEL
Stampings — Hinges — Washers

C. HAGER & SONS HINGE MFG. CO.
2400-2457 DeKalb Street St. Louis, Mo.

One of several 40-foot heat treating furnaces

A corner of our test laboratory

THE PARISH PLANT IS IDEAL FOR THE PRODUCTION OF HEAVY GAUGE AND HEAT TREATED STEEL STAMPINGS

Heat Treated Bus
and Truck Frames
Press Forgings
Heavy Gauge
Stampings
+

In the first place, Parish is the World's largest manufacturer of bus and truck frames. Naturally, you would expect more than ordinary equipment and facilities in the Parish Plant. So, should you care to visit our plant here in Reading, Penna., we promise you'll not be disappointed—for here we have the finest and last word in heavy press equipment; straight line production methods that obviate all back tracking and side stepping of materials; continuous heat treating furnaces that take lengths up to 40 feet; a tool room that makes all our dies and tools; and a machine shop that is equipped to handle production machining operations.

Here, also, is a laboratory that takes all guesswork out of materials and processes, and a corps of engineers whose long experience in heavy gauge and heat treated stampings and pressed forgings will save you money and worry in redesigning your sand castings into better, cheaper, lighter, and less costly pressed steel parts. If you can't call on us personally, tell us what your problems are and we'll give you our wholehearted cooperation.

PUT IT UP TO *Parish* PRESSED STEEL CO.
of READING, PA.

Pacific Coast Representative—F. SOMERS PETERSON CO.,
57 California St., San Francisco, Cal.

ASSOCIATED **Spicer** COMPANIES

BROWN-LIPE	PARISH	SALISBURY	SPICER
CLUTCHES and TRANSMISSIONS	FRAMES AND STAMPINGS	FRONT and REAR AXLES	UNIVERSAL JOINTS
BROWN-LIPE GEAR CO. SYRACUSE, NEW YORK	PARISH PRESSED STEEL CO. READING PENNA.	SPICER MFG. CORP. TOLEDO OHIO	SPICER MFG. CORP. TOLEDO OHIO

Lower Costs, Greater Strength, Reduced Weight, and Less Machining can be secured by letting us redesign that costly casting into PRESSED METAL.
Lansing Stamping Co.
So. Penn. Ave.
Lansing, Mich.
District Sales Office
Harries Bldg., Dayton, O.

STAMPINGS

Small light up to large heavy 1" in thickness in steel copper, brass, aluminum, etc.

Special Engineering Service for designing of castings, forgings, etc., into more economical stampings.

Complete facilities for welding, plating, enameling and finishing your work. Send blue prints for estimates.

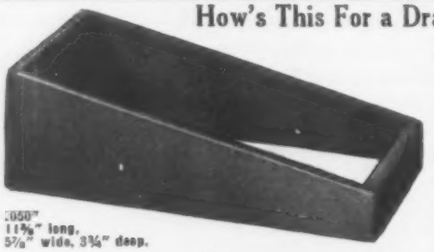
by BOSSERT

THE BOSSERT CORPORATION Utica, N.Y.
30 Church Street, New York City; 605 Swetland Bldg. Cleveland, Ohio; 1122 Book Bldg., Detroit, Mich.

STAMPED, PRESSED AND DEEP DRAWN PARTS
IN ANY COMMERCIAL METAL AND IN ANY FINISH REQUIRED
DETROIT METAL SPECIALTY CORP.
DETROIT, MICH.

STAMPINGS
PRESSED METAL
IN ALL METALS AND GAUGES, DRAWN, FORMED, STAMPED AND ASSEMBLIES.
THE METAL SPECIALTY CO.
1533 WEST SIXTH ST., CINCINNATI, O.

How's This For a Drawing Job?



This check writer case is just another of dozens of difficult drawing jobs done in our shops. Send us the specifications for your work. A complete engineering service is ready to help you.

THE SEYMOUR PRODUCTS CO.
The H. A. Matthews Mfg. Co.
The Seymour Metal Goods Co.
99 RIVER ST., SEYMOUR, CONN.
EST. 1890

STAMPINGS
Complete Plant
Over 30 Years' Experience
The OTTO KONIGSLOW MFG. CO.
CLEVELAND OHIO

FINISHED BRONZE BEARINGS
also BRASS, BRONZE, COPPER and ALUMINUM CASTINGS
UP TO 2,000 POUNDS
It is the company with special or unusual requirements that we can please best. Estimates upon request.
ERIE BRONZE CO. 1832 CHESTNUT ST., ERIE, PA.

DIAMOND TRADE MARK GRILLES

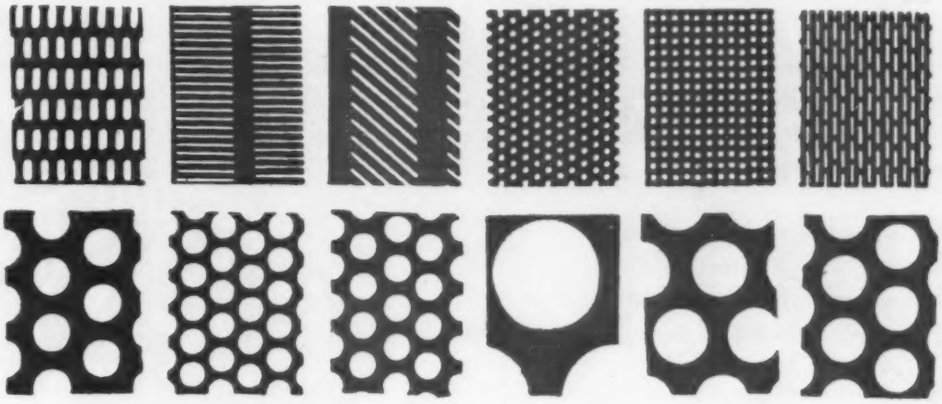
Philadelphia
New York (Brooklyn)
Pittsburgh—Detroit—Boston
Washington—Baltimore
Hazleton, (Pa.)

The Symbol of HIGHEST QUALITY in
Perforated Metals

BUYERS whose requirements are most exacting will recognize in Diamond perforated metals and architectural grilles, products that represent the highest degree of excellence. Complete catalog sent promptly upon request.

Produced by
DIAMOND MANUFACTURING CO.
Plant—Wyoming, Pa.

PERFORATED METALS



All Sizes and Shapes of Holes in All Kinds and Thicknesses of Metal

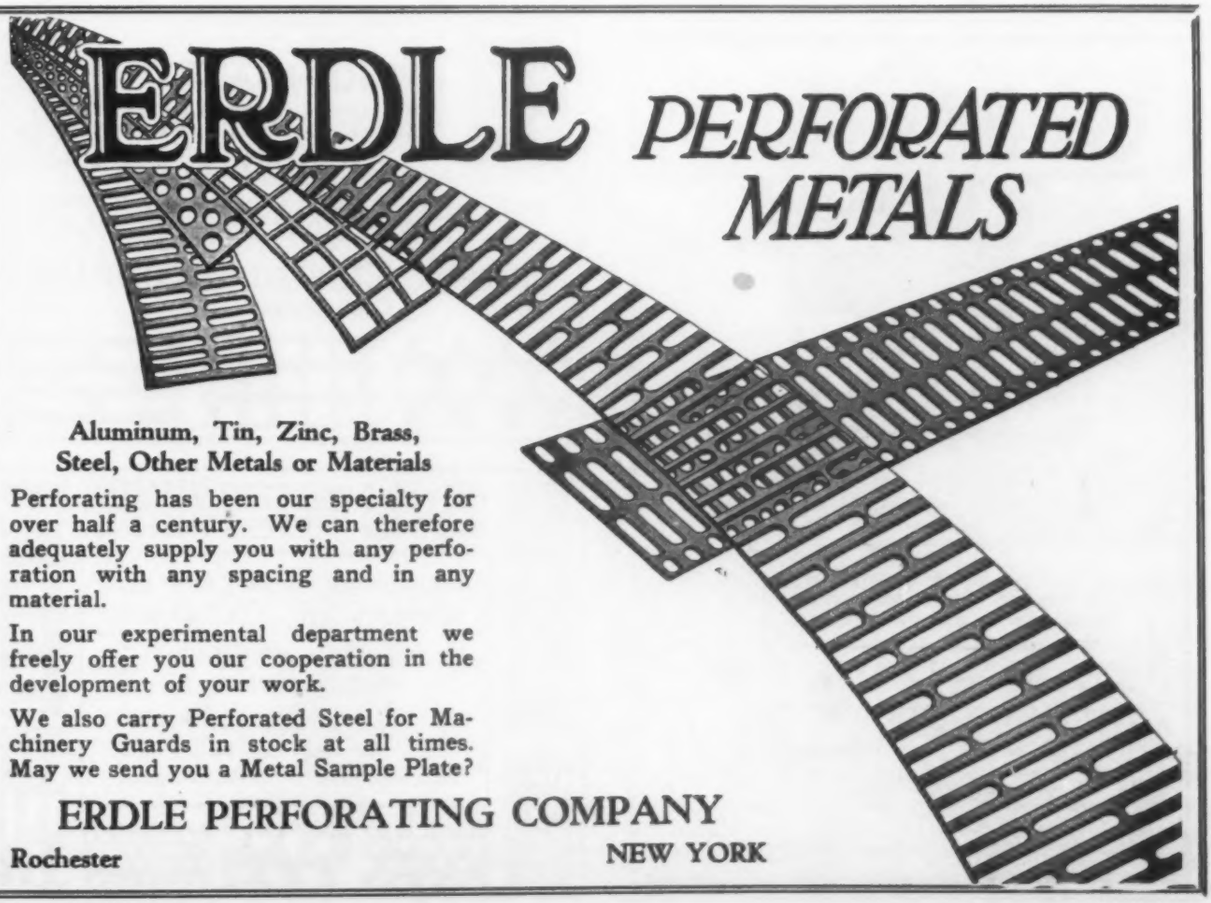
Sheets and Plates of any metal perforated to suit your particular purpose. Our equipment and organization are adequate for extensive and complicated work.

THE HARRINGTON & KING PERFORATING CO.

5657 FILLMORE ST., CHICAGO, ILLINOIS, U. S. A.

New York Office: 114 Liberty Street

ERDLE PERFORATED METALS



Aluminum, Tin, Zinc, Brass, Steel, Other Metals or Materials

Perforating has been our specialty for over half a century. We can therefore adequately supply you with any perforation with any spacing and in any material.

In our experimental department we freely offer you our cooperation in the development of your work.

We also carry Perforated Steel for Machinery Guards in stock at all times. May we send you a Metal Sample Plate?

ERDLE PERFORATING COMPANY

Rochester NEW YORK

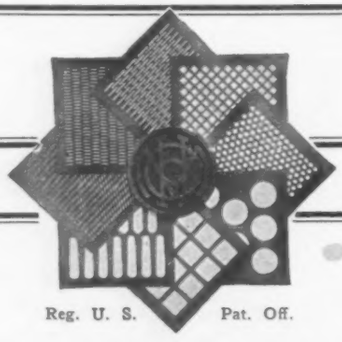
Perforated Metals

During our 35 years of manufacturing Perforated Metal we have continually adhered strictly to the policy of SERVING our customers, realizing such a policy to be the keynote of success.

We serve them better by keeping on hand Copper, Steel, Bronze, Brass, Tin, Aluminum. Ready to punch into any variety or kind of screen.

You will find our catalog interesting.

CHARLES MUNDT & SONS
59 FAIRMOUNT AVE.
JERSEY CITY, N.J.



Reg. U. S. Pat. Off.

The Quantity Is Set by You
The Quality Is Set by Us

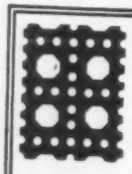
IF you ordered one square foot of Hendrick punched plate, it would be of the same high quality as if you ordered a thousand square feet.

We have set and maintain a high standard. You are assured of this no matter what quantity you buy.

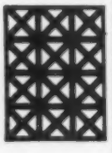
HENDRICK
MANUFACTURING CO.
37 Dundaff St., Carbondale, Pa.

New York Office: 30 Church St.
Pittsburgh Office: Koppers Bldg.
Hazleton, Pa., Office: 533 Lincoln Street

Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site Treads and Mitco Armorgrids, Elevator Buckets of all Types

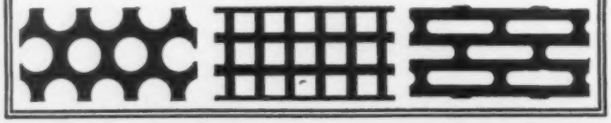


PERFORATED SHEET METALS OF QUALITY



ROUND, SQUARE, SLOT AND SPECIAL PERFORATIONS for Screens, Grilles, Radiator Covers, and all purposes requiring a strong, flat, easily fabricated and attractive mesh.

CROSS ENGINEERING COMPANY
CARBONDALE, PA.



PERFORATED METALS and SCREENS OF ALL KINDS

MATERIAL IN STOCK
PROMPT SHIPMENT

Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

DURBAR

HIGH LEAD BRONZE BEARING METAL

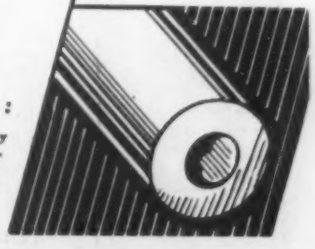
The great increase of speed in modern machinery naturally increased friction also—necessitating the development of a bearing metal capable of offsetting this additional friction.

DURBAR High Lead Bronze Bearing Metal has been very successful in meeting these demands—giving maximum efficiency and service at a low cost.

In a number of instances DURBAR Bearings have outlived other bearings 6 to 10 times and are highly recommended as a superior substitute for phosphor bronze.

It is widely adaptable for heavy duty service in reaming and tapping machines, presses, threading machines, drills, grinders, cranes, crushers, motors, locomotives and for general industrial service.

DURBAR Bearing Metal is available in Standard and Hard grades; in stock bars and special castings. Soft and Extra Hard grades on order.



DISTRIBUTORS:

Wilson Petty Co.....New York City
Paulsen Supply Co.....Chicago, Ill.
James R. Fuller.....Pittsburgh, Pa.
C. E. White & Co...Cleveland, Ohio
H. A. Strickland.....Detroit, Mich.
Waldo, Egbert & Malthy, Inc.
Buffalo, N. Y.

We are SPECIALISTS in SAND CAST ALUMINUM BRONZE CHILL CAST TIN BRONZE and ALUMINUM BRONZE DIE CASTINGS

We also manufacture DURBAR BEARING BRONZE

A *high lead* bronze bearing metal giving the longest service at the lowest cost.

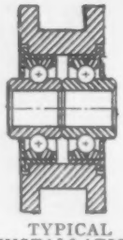
BUFFALO BRONZE DIE CAST CORPORATION

100 Arthur St. Buffalo, N.Y.

"Commercial"

ONE DOZEN BEARINGS
or
A MILLION

Furnished promptly for any kind of a job

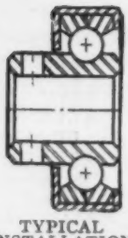


TYPICAL INSTALLATION

ANY quantity of bearings for any purpose. Stock bearings, or bearings made to your B. P. specifications. We are organized to take care of *every* bearing requirement. "COMMERCIAL" Annular ball bearings have the famous three-point contact. Speeds up to 2500 R.P.M. A larger number of balls. Dual radial thrust load. In other words, the ideal bearing—precision plus quality, combined with moderate price.

Send for Illustrated Catalog, Discount Sheets and Samples

THE SCHATZ MANUFACTURING CO., POUGHKEEPSIE, N. Y.
DETROIT—917 BOOK BLDG.



TYPICAL INSTALLATION

BEARINGS

ENDURANCE

"SABECO" Bearing Metal is best exemplified by the word ENDURANCE.

No matter what the service condition—High Speed —Pounding—Heat—Great Pressure—or Excessive Friction—"SABECO" will stand up and give unequaled service—service that you never thought possible in a bronze bearing metal.

It owes its enduring quality to our exclusive process of combining copper, tin, and lead into an absolutely uniform and non-segregating bronze.

For more detailed information write to—

FREDERICKSEN CO.
841 SOUTH WATER STREET
SAGINAW, MICHIGAN

5-108 General Motors Building
Detroit, Michigan

Room 418-E, 30 Church Street
New York City

FOUR GRADES
For Every Type of Service

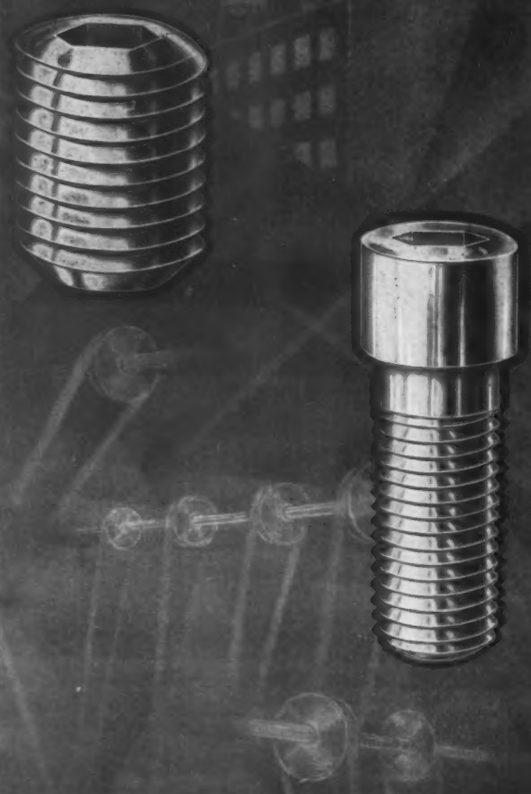
"SABECO"
CORED AND SOLID BARS CARRIED IN STOCK
Ask Your Mill Supply Jobber

It Wears Longer!

"SABECO" METAL Reg. U. S. Pat. Office
INGOTS, SOLID BARS, CORED BARS, CASTINGS FINISHED TO SPECIFICATIONS
The Certified Bearing Bronze

"Know Your Bearings"

Allen
Cold drawn



Seen in a FRIENDLY Light

The engineer or machine designer sees Dependability for his machine. The production manager or superintendent sees Continuity for his production. The purchasing agent sees Economy on his replacements. Each sees different things in the ALLEN - - - but all see the same staunch support.

The Allen Mfg. Company
Hartford, Conn.

BUCKEYE BETTER BUILT BUSHINGS

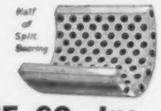
FINISHED STOCK BUSHINGS
Send for stock card
BRONZE BARS CORED & SOLID
Send for weight chart

YOUR ability to turn out accurate work, maintain production schedules and make a good profit depends largely on the quality of bushings and bearings you use—they must be dependable, and cheap ones may cost you your reputation as a reliable manufacturer.

BUCKEYE BRASS & MFG. CO.
6410 Hawthorne Ave.
CLEVELAND OHIO

OILLESS BUSHINGS AND BEARINGS

METALINE
(Reg. Trade Mark)
that require no attention
Write for information



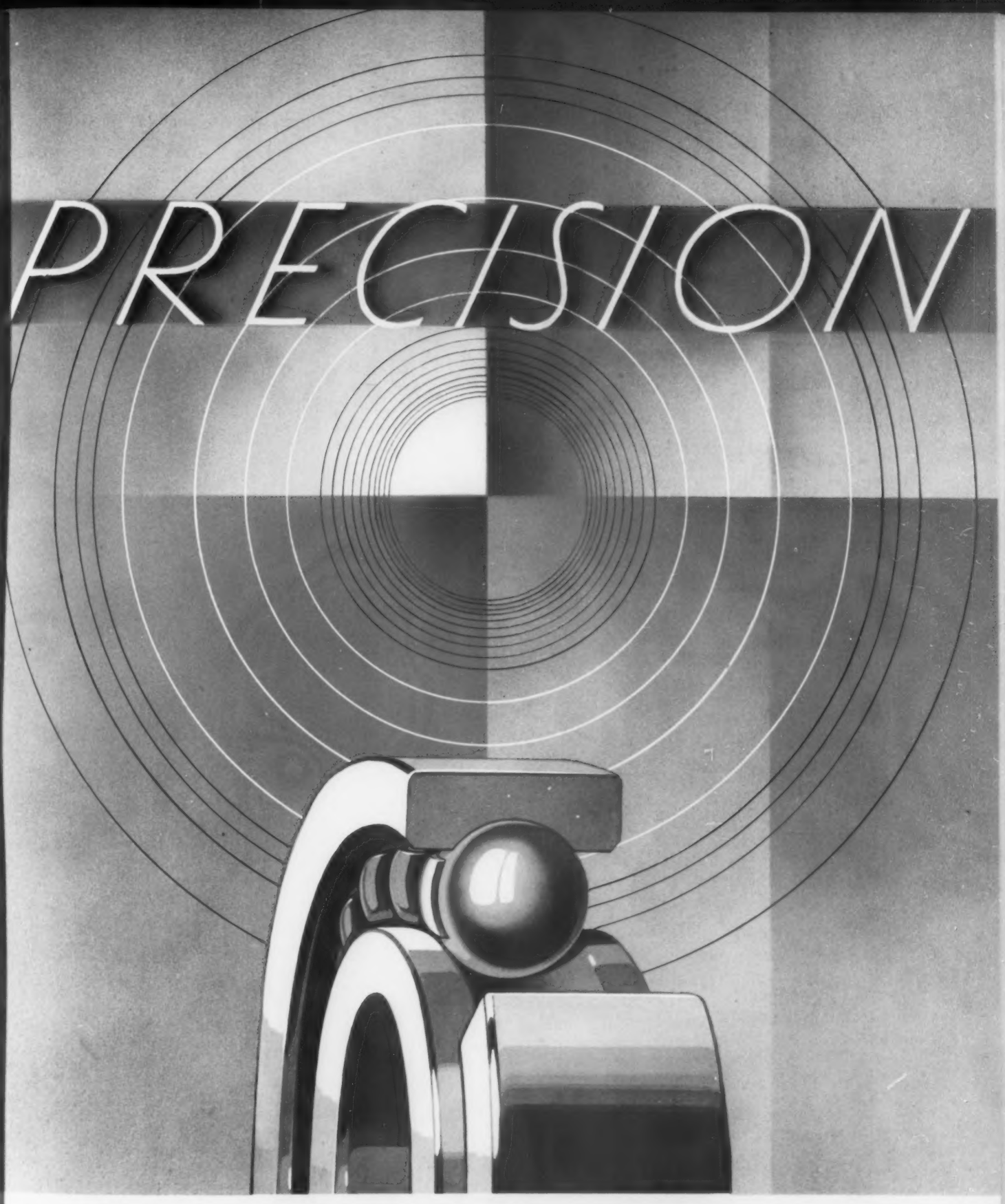
R. W. RHOADES METALINE CO., Inc.
Tel. Hunters Point 2318 43 3rd St., Long Island City, N. Y.

AUBURN
BALL BEARINGS
Write for Data Sheets
AUBURN BALL BEARING CO.
63 Clarissa St. Rochester, N. Y.

The BANTAM BALL BEARING CO.
SOUTH BEND INDIANA
JOURNAL — RADIAL — THRUST
Ball and Roller Bearings, ½" to 40" in. diameter-ONE OR A MILLION. Standard and special size

SHIMER

SCREW MACHINE PRODUCTS
Milled from the bar with die-cut threads. 1/16" to 3". Iron, Steel or Brass.
Samuel J. Shimer & Sons, Milton, Pa.

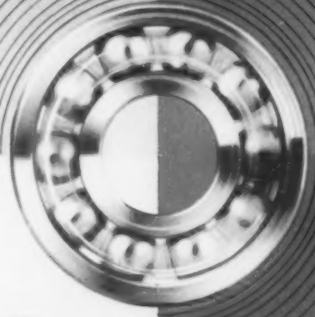


PAINSTAKING PRECISION IN DESIGN AND MANUFACTURE IS REFLECTED IN THE FLAWLESS SERVICE THAT FAFNIRS PROVIDE.

FAFNIR BALL BEARINGS

ULTRA-PRECISION

spindle mounting



on wear-proof

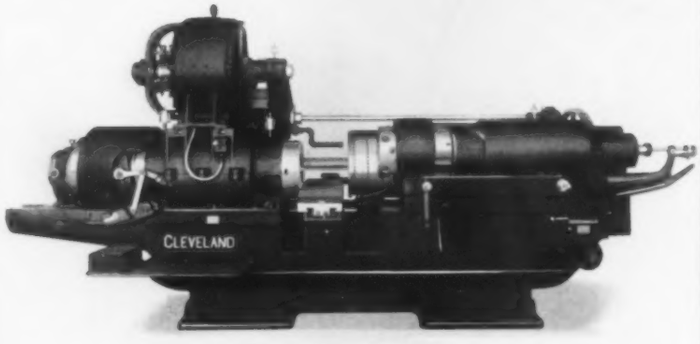
FAFNIRS

Accurate, rapid machining — that's what users of Cleveland Automatics expect and get. Spindles always run true — never need adjustment — when mounted on wear-proof Fafnir Ball Bearings. And all the other vital parts throughout the machine are likewise maintained in perfect alignment (in some automatics as many as 74 Fafnir Ball Bearings are used).

Day after day the Fafnirs whirl silently and friction free. The deep races and maximum number of large diameter balls provide positive protection against every load at any speed. They are of tough alloy steel and hardened throughout (not merely case hardened).

Accuracy in manufacture is reflected in the flawless mountings which Fafnir Ball Bearings are providing for America's leading machine tool builders. They know that it pays to specify "Fafnirs throughout".

THE FAFNIR BEARING CO., New Britain, Conn.
New York . . . Chicago . . . Milwaukee . . . Detroit
Newark . . . . . Cleveland . . . . . Philadelphia



FAFNIR
BALL BEARINGS

Tougher heads, finer threads

MADE by the Kaufman Method, *patented*, Cleveland Cap Screws are a better product than was heretofore possible in cap screw production. Improvement in such a product must come in its *method* of manufacture, for anyone can buy steel to specifications, and provide proper heat treatment.

Improvements in method are painfully slow—since development can come only from experimental procedure. The Kaufman Method was one of tedious development—not of months, but of years, in achievement of an ideal.

THE CLEVELAND CAP SCREW COMPANY
2930 E. 79th St., Cleveland, Ohio
Address the Nearest Company Warehouse—Complete stocks at

CHICAGO, 726 W. Washington Blvd.
DETROIT . . 520 W. Congress Street
PHILADELPHIA . 12th & Olive Sts.
SAN FRANCISCO . 548 Howard St.
NEW YORK . . . . 47 Murray Street
LOS ANGELES . . . 224 E. 11 Street

CLEVELAND CAP SCREWS

CORBIN

Wood Screws
Drive Screws
Coach Screws
Machine Screws
Set Screws
Cap Screws
Saw Screws
Thumb Screws
Hand Rail Screws
Special Automatic Screw Machine Products
Stove Bolts
Tire Bolts
Agricultural Bolts
Sink Bolts
Hanger Bolts
Machine Screw Nuts
Stove Tire Bolt Nuts
Semi-Finished Nuts
Castellated Nuts
S.A.E. Nuts
Jack Chain
Plumbers Chain
Register Chain
Safety Chain
Furnace Chain
Ladder Chain
Sash Chain
Escutcheon Pins
Speedometers

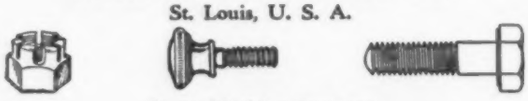
CORBIN

UNIFORM QUALITY *and* ADEQUATE STOCK

The CORBIN SCREW CORPORATION
The American Hardware Corp., Successor
NEW BRITAIN, CONN.
Warehouses—New York, Chicago, Philadelphia
Western Factory—Dayton, Ohio

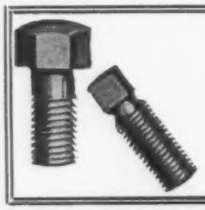
SPECIAL PARTS TO SUIT YOUR DRAWINGS OR SAMPLES
HEAT TREATING
SCREW MACHINE PRODUCTS
THE DAVID BELL COMPANY, INC.
1555 FILLMORE AVE.
BUFFALO, N.Y.
SEND FOR ILLUSTRATED CATALOG NO. 426

Western Screw Products Co.
St. Louis, U. S. A.



Screw Machine Products
Castle Nuts—Set Screws—Cap Screws

SCREW MACHINE PRODUCTS
ACCURATELY MADE AT A FAIR PRICE
ARE MORE ECONOMICAL
Specialists in the production of screw machine products for 15 years. Let us quote on your requirements.
Screw Machine Products Corp., 1014 Eddy St., Providence, R. I.



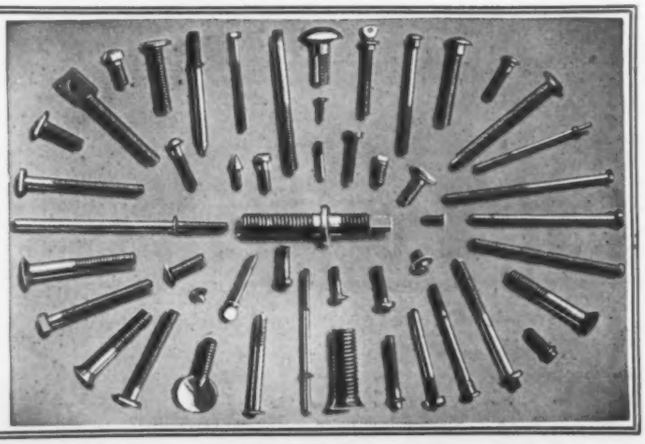
Screw Machine Products
CAP AND SET SCREWS
The
Wm. H. Ottemiller Co., Inc.
Pattison St. and M. & P. R. R. York, Pa.

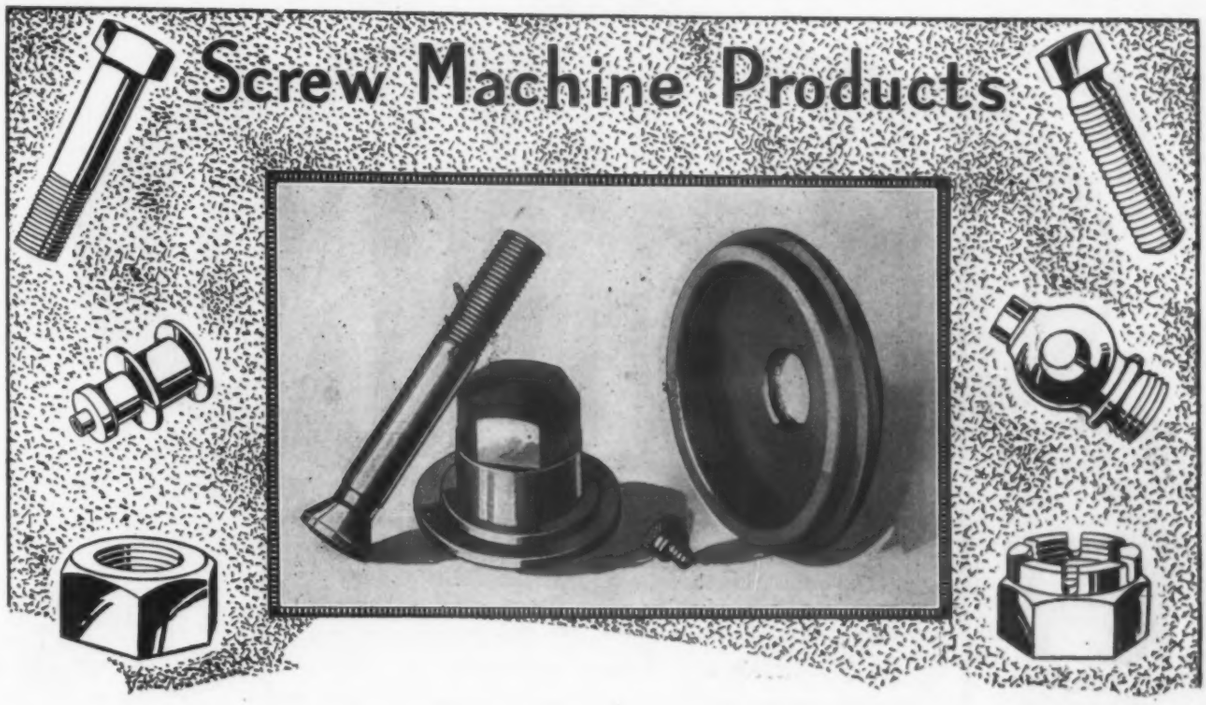
HEADING SPECIALISTS

A great many products at present milled from the bar can be developed by our process at a great saving. The illstration shows a variety of products we have developed for other manufacturers by the cold heading process.

If you have similar requirements let our specialists cooperate with you. There is a large price advantage and it will pay you to get in touch with us.

The Progressive Manufacturing Company
TORRINGTON, CONN., U. S. A.
IN STOCK AT ALL TIMES
Standard Machine Screws
Machine Screw Nuts
Interchangeable bolts and nuts made strictly to A.S.M.E. tolerances.





Anything . . . .

Nuts
Bolts
Cap Screws
Set Screws
Milled Studs
Binding Posts

Standard and Special Parts in Steel, Brass Copper, Alloys

that can be made on a screw machine — by the hundred or by the million. ¶ Ten acres of floor space devoted to the production of metal parts. ¶ A standard of accuracy which needs no apology.— And the prices are *right!*

Send us your specifications

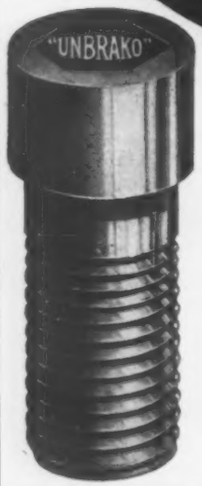
The National Acme Company

General Offices and Plant
Cleveland, Ohio
Machine Plant: Windsor, Vt.

NATCO
REG. U.S. PAT. OFF.

Branch Offices
New York — Detroit — Chicago
Agents in Principal Foreign Countries

UNBRAKO



The trade-name in the oval describes our Screws exactly —you just can't break them and that is a fact.
Free samples for doubting Thomases—and if they don't convert you to "UNBRAKO" Screws, we'll quit.

Bulletin 398—Yours for the Asking

STANDARD PRESSED STEEL CO.

BRANCHES BOSTON CHICAGO DETROIT

JENKINTOWN, PENNA.
BOX 523

BRANCHES NEW YORK SAN FRANCISCO ST. LOUIS

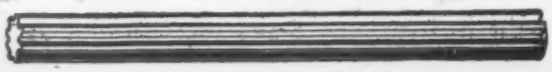
CUT THESE FROM THE BAR

Don't machine them from solid stock. We will supply you with pinion rods, squares, flats, hexagons and other wire shapes for less money than you could possibly make them.

Write for our interesting proposition to-day.

A. B. & J. Rathbone
Palmer, Mass.

Michigan Agents
Geo. E. Quigley, Inc.
1908 Washington Blvd. Bldg.
Detroit, Mich.



Buffalo Bolt Co.

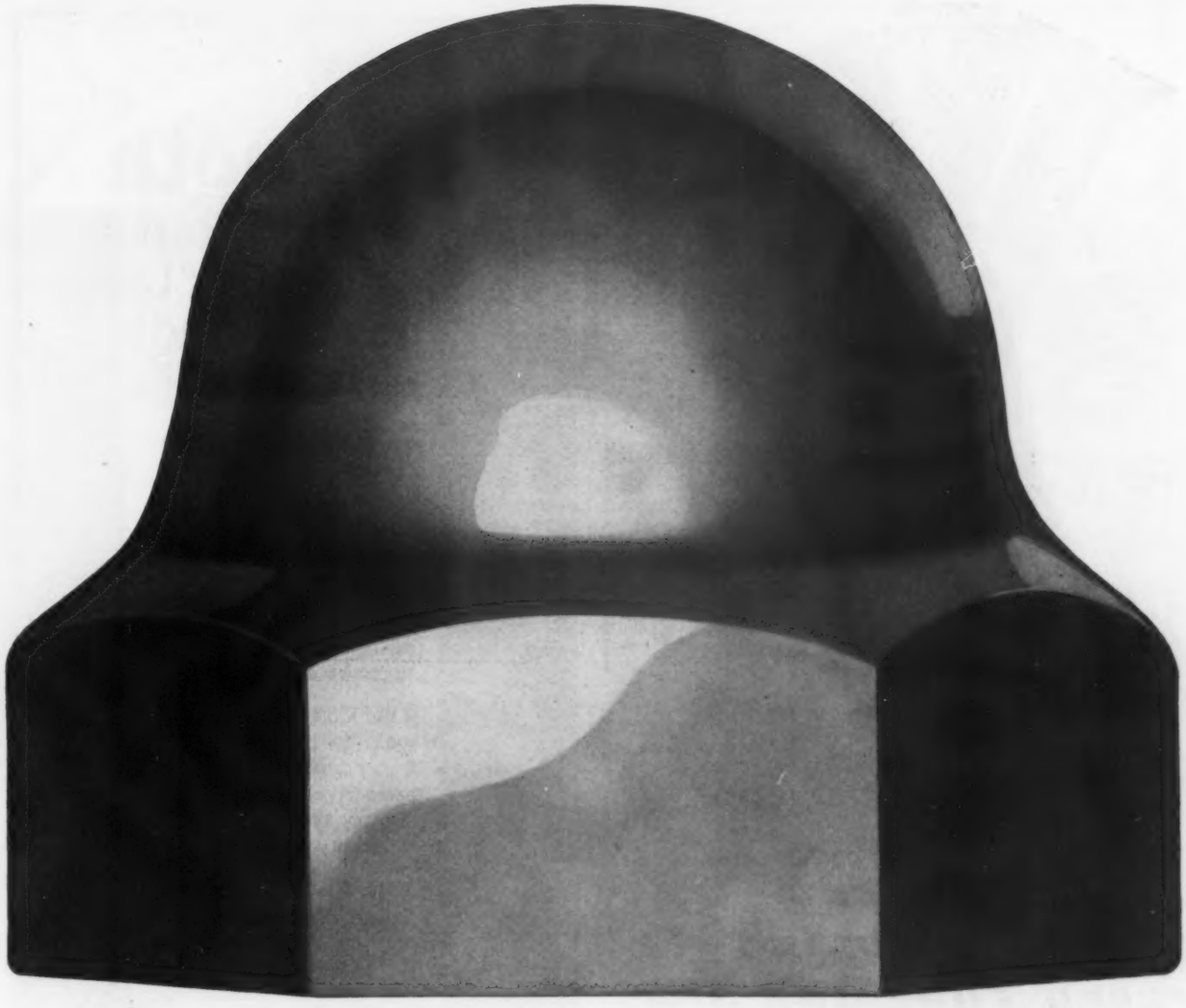
North Tonawanda, N. Y.

BOLTS, NUTS, LAG SCREWS
STEEL BARS, WIRE
of exceptional quality

SALES OFFICES:
Chicago Detroit

BOLTS TRACK MACHINE
SPIKES TRACK, BOAT DOCK, GUARD
BARS IRON STEEL
EST. 1859 **W. AMES & CO.** FACTORY & OFFICE JERSEY CITY, N.J.

STANDARD and SPECIAL
NUTS
MILLED FROM BAR
WESTFIELD NUT COMPANY WESTFIELD, MASS.



Hide Unsightly Bolt Ends

YOUR finished product will have a much neater, more attractive appearance if you use the Ferry Patented Acorn Nut. Its finely finished shell of brass or steel, over a steel hexagon nut, hides completely the unsightly ends of screws and bolts. Admirably suited for chromium or nickel plating, and available in popular sizes to meet every requirement. May we submit samples and specifications?

THE FERRY CAP AND SET SCREW COMPANY - *Cleveland, Ohio*

FERRY

PROCESS SCREWS

One Standard of Quality in every Type and Size

Reed and Prince Products *include:*

Wood Screws
Machine Screws
Cap Screws
Set Screws
Stove Bolts
Sink Bolts
Hanger Bolts
Machine Screw Nuts
Stove Bolt Nuts
Chair Rods
Stove Rods
Seat Rods
Specialties

Available in any finish — nickel, blued, copper, bronze, brass, galvanized, plain, polished, cadmium, chromium.

Reed & Prince Screw Products can be depended upon for unvarying uniformity in strength, finish and dimensions. Every Screw, Nut and Bolt meets the highest standards of quality and accuracy.

For GOOD WORK use dependable Reed & Prince Products. Your largest requirements can be handled promptly. May we submit samples and prices.

REED & PRINCE MFG. CO.
WORCESTER, MASS., U.S.A.
WESTERN BRANCH AT CHICAGO - 3635 IRON STREET

Strength we have but that isn't everything in a bolt

How about the uniformity of threads and finish?

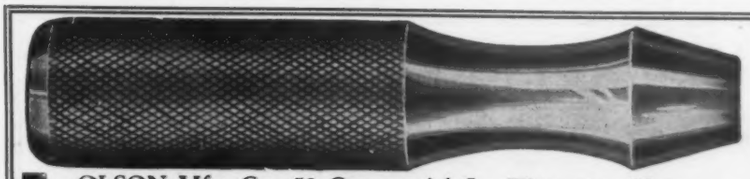
The threads of Clark bolts, nuts, and screws are as gauge true as it is possible for modern design and machinery to make them.

The Clark process of making bolts imparts a certain beauty and attractive finish that instantly sets them apart from any other make.

These advantages are coupled with superior service and intelligence in handling orders, whether for standard or special bolts, nuts, and screws — it makes an unbeatable combination.

Let us quote on your next needs.

CLARK BROS BOLT CO.
(76 Years are Back of Every Piece Produced)
Clark St.
MILLDALE, CONN.



OLSON Mfg. Co., 53 Commercial St., Worcester, Mass.

If Your Screw Product Requirements Are Unusually Exacting—

call on Olson. Many manufacturers rely upon our modern facilities and twenty-five years' experience when they want work of unusual quality.

Let us show you what we can do, in steel and brass up to 2¼" in diameter.

New York Office—5 Beekman St.
Philadelphia Office—15th and Chestnut Streets

OLIVER

IRON AND STEEL CORP.
PITTSBURGH, PA.

BOLTS . . . NUTS . . . RIVETS . . . SCREW SPIKES . . . POLE LINE HARDWARE . . . TRACK BOLTS . . . PLAIN AND UPSET RODS . . . CAR AND GENERAL FORGINGS

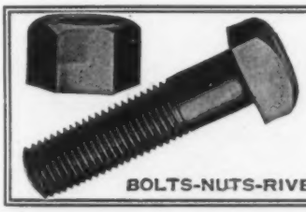
THUMB NUTS and THUMB SCREWS
MALLEABLE IRON

Formerly made by Thomas Devlin Mfg. Co., Philadelphia

We carry a large stock and variety of styles and sizes of thumb nuts and thumb screws, threaded and blank.

Malleable and Grey Iron Castings

Philadelphia Hardware & Malleable Iron Works, Inc.
9th and Jefferson St., Philadelphia, Pa.



Neely
NUT & BOLT CO.
PITTSBURGH, PA.
BOLTS-NUTS-RIVETS-RODS-UPSET FORGINGS

NICETOWN PLATE WASHER CO., Inc.
IRON AND STEEL BARS
DEFORMED STEEL BARS THREADED RODS
HEAVY DISCS OR WASHERS SQUARE WASHERS
BEVEL WASHERS MANHOLE STEPS SEWER STEPS
HOT GALVANIZED BARS AND WASHERS
JUNIATA AND CLARISSA STS.
NICETOWN, PHILA., PA.

MISCELLANEOUS WIRE NAILS AND BRADS
In Packages, ¼, ½, 1 lb.; 25 and 50 lb. Boxes

OTHER WIRE PRODUCTS
SCREEN WIRE CLOTH
Painted, Galvanized and Bronze
GALVANIZED HARDWARE
WIRE CLOTH
POULTRY NETTING, WIRE,
Bright, Annealed, Coppered, Galvanized and Tinned.
Write your Jobber for Full Information and Prices.

WICKWIRE BROTHERS
ENTIRE FACTORY AND OFFICES
Cortland, New York, U. S. A.
Established 1873 Incorporated 1892

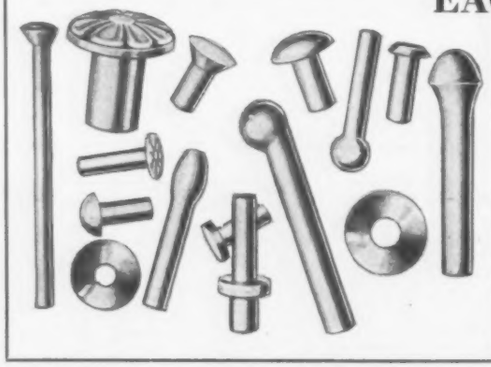
RHODE ISLAND TOOL COMPANY

(ESTABLISHED 1834)

NUTS — BOLTS — SCREWS — WRENCHES
SCREW MACHINE PRODUCTS
DROP FORGINGS

SEND US YOUR SPECIFICATIONS

PROVIDENCE - - - - RHODE ISLAND



EAGLE BRAND RIVETS, WASHERS

Special Rivets and Washers of Brass, Bronze, Copper and Nickel Silver

made to order for all purposes.

Copper Belt Rivets—Burrs and Bolt Size Brass Washers

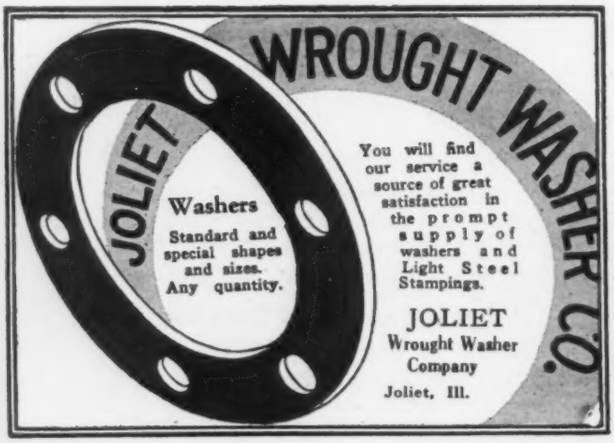
carried in stock for immediate shipment.

THE PLUME & ATWOOD MFG. CO.
WATERBURY CONN., U. S. A.

"The World's Largest Producer of Washers"

We Also Manufacture Metal Stampings

WROUGHT WASHER MFG. CO.
Established 1887
MILWAUKEE WISCONSIN


JOLIET
WROUGHT WASHER CO.
Washers
Standard and special shapes and sizes. Any quantity.
You will find our service a source of great satisfaction in the prompt supply of washers and Light Steel Stampings.
JOLIET
Wrought Washer Company
Joliet, Ill.

MACHINE KEYS

GIB HEAD
PLAIN—FEATHER
WOODRUFF KEYS
TAPER PINS

Send for Our Prices

BUFFALO MACHINE KEY CO.
62 Clyde St., Buffalo, N. Y.

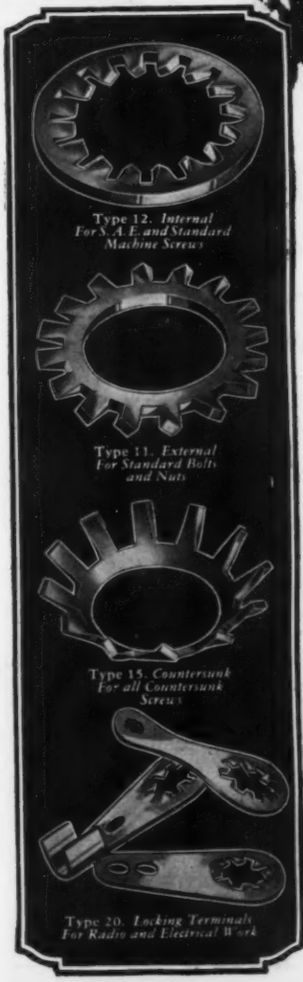
SPRING COTTERS
of all descriptions—
Flat or round. Let us quote you on stock sizes. Prompt deliveries.
F. P. SMITH & COMPANY, Manufacturers
SHARON HILL, PA.

HIGH CARBON
STEEL WIRE

JOHNSON STEEL & WIRE CO., Inc.
WORCESTER, MASS.

U. S. Patents 1,410,584
1,004,122—1,087,954
Other patents pending.
Foreign patents.

There is NO EXCUSE for using faulty Lock Washers!



COMPLAINTS cost money. A single dissatisfied customer can cause the loss of many future sales. No manufacturer can afford to "save money" by neglecting to protect his product against the damaging action of vibration.

Decide now to investigate Shakeproof Lock Washers. See for yourself how this positive, multiple locking principle holds any nut or screw absolutely tight. Watch the twisted teeth dig in deeper as vibration increases and then you'll know why Shakeproof Lock Washers are adding years of faithful performance to hundreds of products.

A test in your own shop tells the story. Make the trials as severe and exacting as you please. Shakeproof deserves a place on your product and is ready to prove it! Send for free samples today.

"It's the Twisted Teeth that LOCK"

SHAKEPROOF
Lock Washer Company
(Division of Illinois Tool Works)
2525 North Keeler Ave., Chicago, Illinois

Flat Wire

John A. Roebling's Sons Company
Trenton, N. J.

HIGH CARBON and ALLOY **STEEL WIRE** TEMPERED and UNTEMPERED
ROUNDS, NARROW FLATS, SHAPES

GENERAL OFFICE:
250 Fifth Ave.
New York City

STEWART HARTSHORN COMPANY
Est. 1860

FACTORY:
East Newark,
New Jersey

MUSIC WIRE

STRENGTH · UNIFORMITY · DURABILITY · EQUAL · PROOF

THE WEBB WIRE WORKS
NEW BRUNSWICK, N.J.

RIBBON METAL PRODUCTS AND WIRE SHAPES

Our expert skill and automatic machinery are at your service. Careful attention to detail and prompt delivery assured. Send blueprint or sample for estimate.

Eastern Tool & Manufacturing Company
129 Bloomfield Ave., Bloomfield, N. J.

IRON and STEEL
WIRE

Established in 1857, these Mills have been devoted to the manufacture of the highest grades of wire as well as specialties in wire drawn from Swedes Iron, Bessemer, Open Hearth and Crucible Steel.

Special Wires from Carbon Steels of Particular Analyses.

GEO. W. PRENTISS & CO.
HOLYOKE, MASS.

Buffalo WIRE

"A BETTER WIRE CLOTH"
For all industrial purposes. Prices and information on request.
BUFFALO WIRE WORKS CO., Inc.
456 Terrace (Formerly Scheeler's Sons) Buffalo, N. Y.

WIRE SHAPES *of Every Kind*

Hindley Mfg. Co., Valley Falls, R. I., U. S. A.

Yellow Strand WIRE ROPE

N679

A NEW NAME

for a familiar HAZARD Rope

LAY-SET

PRE-FORMED WIRE ROPE

This is an actual photograph of a piece of Lay-Set Preformed Wire Rope. Note that the end is not seized. Ordinary wire rope, when cut, unravels; the strands and wires straighten out as the confined internal stress is liberated.

HAZARD announces a significant new name in wire rope —"Lay-Set"— (formerly Flex-Set).

This new name more readily associates this familiar rope with its preformed construction—for preforming "sets" each wire and strand to the exact shape it assumes in the finished rope.

Rope users everywhere are turning to preformed rope because preforming entirely eliminates the internal stresses inherent in ordinary wire rope, thereby removing the cause of most early rope failures.

Everything that the name HAZARD has meant to wire rope users for over eighty years—advanced design, first quality materials and craftsmanship, and long dependable service — is exemplified in this familiar rope with the new name,"LAY-SET", preformed by Hazard.

"LAY-SET" Preformed Wire Rope is carried in stock by the branches and dealers listed. Specify it for your next rope requirement.

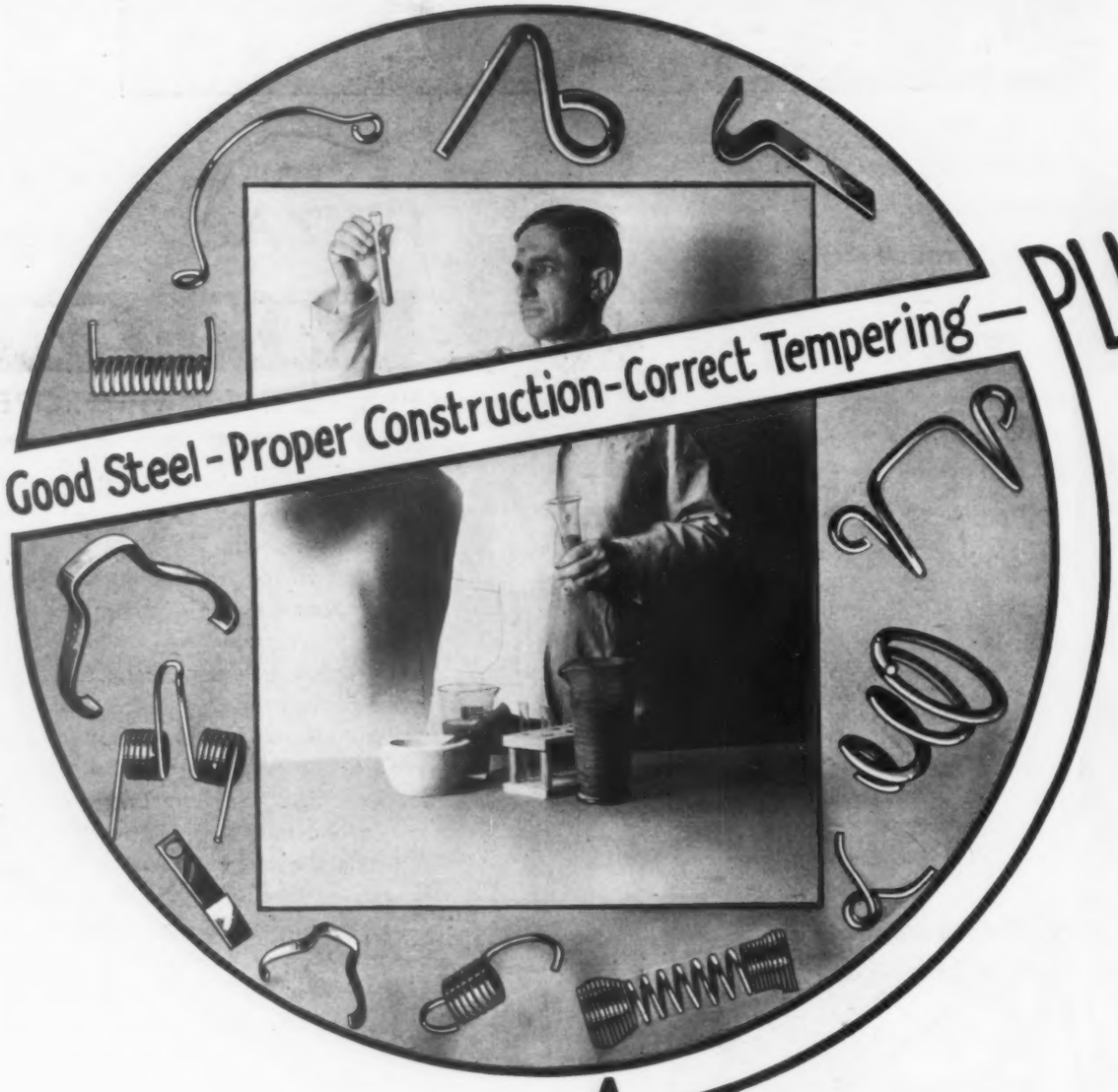
Outstanding Advantages of LAY-SET

1. No internal stresses.
2. Handles readily. Not "cranky".
3. Installed in less time.
4. Equal load on all strands.
5. Less wear on drums and sheaves.
6. LONGER LIFE.

HAZARD WIRE ROPE COMPANY

WILKES-BARRE PENNSYLVANIA

New York Chicago Pittsburgh Philadelphia San Francisco Denver Los Angeles Birmingham



AND the "plus" in this instance is the engineering skill and talent that only a truly competent organization with years of experience can offer you.

In your quest for a reliable source of supply for your spring and special wire shape requirements, remember that Cuyahoga can, and will, meet your highest expectations.

THE CUYAHOGA SPRING CO.
10250 BEREA ROAD, CLEVELAND, OHIO

Chicago, Ill. 208 So. La Salle St. | Detroit, Mich. General Motors Bldg. | New York City Fisk Bldg.

CUYAHOGA SPRINGS and WIRE SHAPES

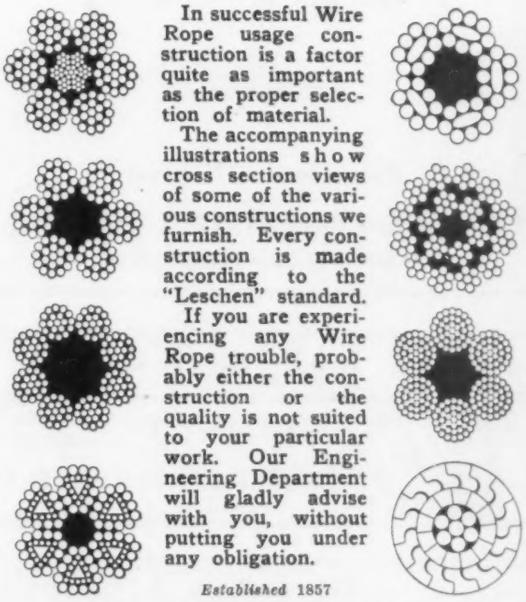
The Cuyahoga Spring Co. 10250 Berea Road, Cleveland, Ohio
Gentlemen: Please give us a quotation on the enclosed (drawing, spring, or wire form) in quantities of ☐ ☐ ☐
We understand this will not obligate us in any way.

Name .....

Address .....

City .....

Leschen Wire Rope for Every Requirement



In successful Wire Rope usage construction is a factor quite as important as the proper selection of material.

The accompanying illustrations show cross section views of some of the various constructions we furnish. Every construction is made according to the "Leschen" standard.

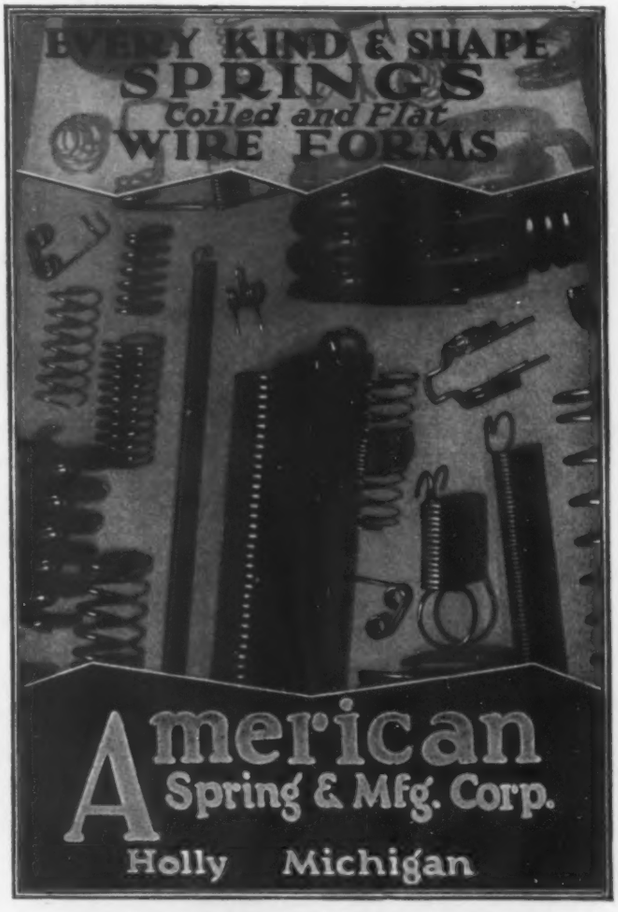
If you are experiencing any Wire Rope trouble, probably either the construction or the quality is not suited to your particular work. Our Engineering Department will gladly advise with you, without putting you under any obligation.

Established 1857

A. Leschen & Sons Rope Co.

Makers of
HERCULES (Red-Strand) WIRE ROPE
ST. LOUIS, U. S. A.

New York Chicago Denver San Francisco



PAGE WIRE PRODUCTS

Spring wire - Fence - Welding wire - Plain *and* Galvanized wire - Strand - Special analysis wire

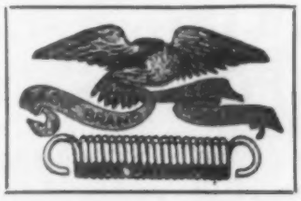
PAGE STEEL *and* WIRE COMPANY

General Sales Office:
New York Central Bldg., 230 Park Ave., New York, N. Y.
District Offices: Chicago New York Pittsburgh San Francisco
An Associate Company of the American Chain Co., Inc.

SPRINGS

WIRE-FORMS
STAMPINGS

EAGLE BRAND



MILLER & VAN WINKLE, INC.
18 BRIDGE ST. BROOKLYN, N. Y.

M. D. HUBBARD SPRING CO.

SOUTH SAGINAW AND JESSIE STREETS
PONTIAC, MICH.
ESTABLISHED 1905

COILED and FLAT SPRINGS
(Phosphor Bronze Springs a Specialty)
WELCH PATENT EXPANSION PLUGS
(For Closing Core Holes)
SPECIAL WIRE SHAPES SMALL STAMPINGS
WASHERS and SPRING COTTERS
Send blue prints or samples for estimates.
(CATALOG MAILED UPON REQUEST)

WELCH PAT. EXPANSION PLUG

WE HAVE OUR OWN PROVING GROUNDS!

DRAWING COMPOUNDS

That we guarantee will do your work regardless of the nature of the draw and

DRAWING COMPOUNDS

That can be cleaned quickly and thoroughly, all at a savings to you.

Give us an opportunity to prove these statements.

BRUCE PRODUCTS CORPORATION

5712 Twelfth St. Detroit, Mich.

LEE-BUILT SPRINGS

Promptly delivered

LEE SPRING COMPANY, INC.
30 Main St., Brooklyn, N.Y.

HUNTER SPRINGS Any Type Any Metal
HUNTER PRESSED STEEL CO.
Lansdale, Pa.

THE CHAS. FISCHER SPRING COMPANY
Round and Flat Springs, Wire Forms, Flexible Shafts and Tubing, complete Mechanical Assemblies
242 KENT AVE. BROOKLYN, N.Y.

USE RODINE
for
PICKLING
And Save at Least 30 Cts. Per Ton

AMERICAN CHEMICAL PAINT CO.
AMBLER, PA.

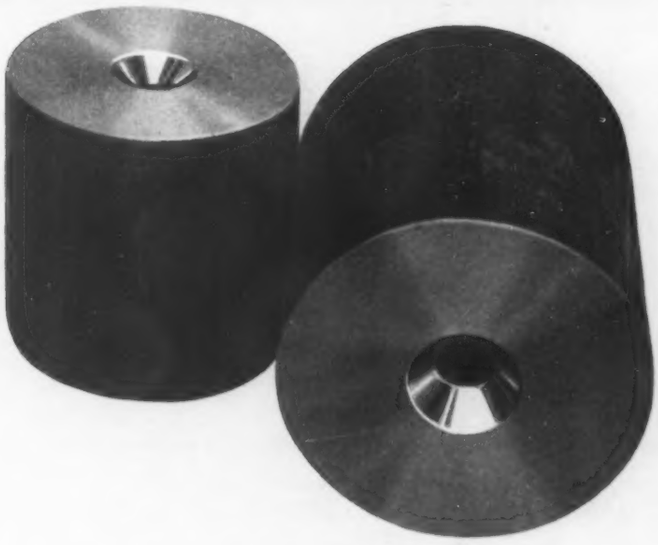
THE
ANTHONY NEBULYTE OIL BURNING SYSTEM
A highly developed system of gas firing with oil fuel, 70,000 applications. Other systems quickly converted. Old burners easily replaced with NEBULYTE Oil and Gas burners. Installations everywhere.
THE ANTHONY CO. LONG ISLAND CITY, N. Y.

HAUCK BLOW TORCHES

Made in all sizes from one quart to 20 gallons capacity to burn gasoline, kerosene, distillates and all fuel oils. Used for heating to straighten or bend, shrink or expand, preheating in connection with gas welding, etc. Furnished in combination with melting furnaces, on legs and on wheels, for lead and babbitt melting. Special torches for lighting powdered coal fires. We have a torch to meet your needs. Write to

HAUCK MFG. CO.—128 - 10th Street—Brooklyn, N. Y.

Die Costs Cut 4/5 by Hardening with AEROCASE Process



One company is saving $60.00, or 4/5 of the former cost, on every roll threading die it uses. This has been accomplished by substituting S. A. E. 3250 steel, hardened in the Aerocase bath, for high speed tool steel. This cheaper die is giving more satisfaction and longer life than the higher priced one.

Another company is effecting economies that are equally as important. Cold heading dies made of S. A. E. 3250 steel treated for one hour in the Aerocase bath at 1500 degrees F. are allowed to cool in the bath to 1375 degrees F. and quenched in oil. They are then drawn in a salt bath at 425 degrees F. for 3 hours. *Dies treated in this manner outlast the more expensive high carbon tool steel dies by more than 2 to 1.*

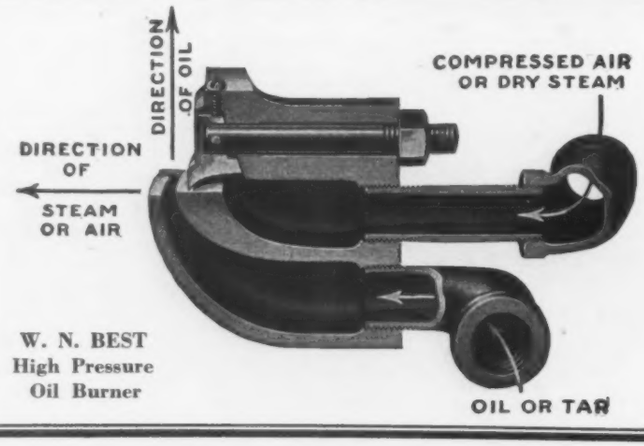
These are random examples of what the Aerocase Process is doing. There are many others. The strength of Aerocase baths is easily maintained. The baths produce uniformly hard, but not brittle, medium depth cases more quickly and more satisfactorily than is possible by any other process. Let us discuss your hardening problems with you.

CYANAMID AERO BRAND PRODUCTS AMERICAN CYANAMID COMPANY

Industrial Chemicals Division

American Cyanamid Company

535 Fifth Avenue New York



W. N. BEST
High Pressure
Oil Burner

THE simplicity of design assures dependable operation of W. N. BEST Oil Burners. We *engineer* the application of oil burners in any type of service.

Catalogs Upon Request

W. N. BEST Corporation
Liquid Fuel Engineers Since 1890
295 Fifth Ave. New York

CHAMPION 401 STEEL RIVET FORGE

Made with adjustable Ball Bearings only.

Capacity 4" round iron in 10 minutes.

Hearth, 18 inches in diameter.

Fan Case, 9 inches in diameter.

Turns Easy
Lasts Longer

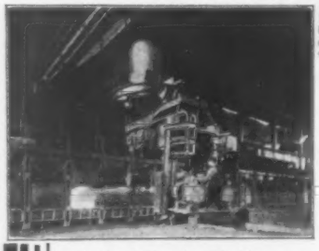
Over a Million in Use

Write for No. 55 Catalogue on Blowers, Forges, Drills, Lathes, Grinders, Hack Saw Machines, Taps and Dies, Power Hammers, Ventilating Fans and Woodworking Machinery, etc.

CHAMPION BLOWER AND FORGE CO.—LANCASTER, PA.

Exclusively Electric
HEVI DUTY
Heat Treating Furnaces
HEVI DUTY ELECTRIC CO.
MILWAUKEE, WISCONSIN.

DETROIT
USED BY THE FOREMOST FOUNDRIES
ROCKING ELECTRIC FURNACES
ROLLING MILLS, SMELTERS AND REFINERS
Detroit Electric Furnace Co. DETROIT, MICH. 625 W. Elizabeth St.



Overhead Charging Machine

The Brosius
Horizontal Charger

is built as a flexible machine, or as a semi-rigid machine, a feature which permits designing the charger to handle its required load instead of to resist the excessive abuse a rigid machine cannot fail to receive. For this reason the flexible or semi-rigid machine of the same capacity is lighter than the rigid type and requires lighter runways, smaller motors, etc., resulting in a considerable saving in first cost and maintenance.

The Brosius Charger rotates through 360° and has five motor driven motions, namely, the bridge, trolley, hoist, rotating, and grip.

The charger can be arranged to serve mills, hammers, presses, or any type of machine requiring the manipulation of large pieces.

EDGAR E. BROSIUS *(Incorporated)*
PITTSBURGH, PA. (Sharpsburg P. O.)

THE ELECTRIC FURNACE BUILDERS OF INDUSTRIAL FURNACES SALEM, OHIO CO.

Annealing - Carburizing - Forging
• FURNACES •
Electric or Fuel-fired Furnaces for Every Requirement.
The Electric Furnace Co.
Salem, Ohio

SC&H Furnaces are built in all sizes of Oven, Pot, Continuous, and Special Types for Electric, Oil or Gas application.

STRONG CARLISLE & HAMMOND
1400 W. 3rd St., Cleveland, O.

SC&H Furnaces are made for annealing, case hardening, carburizing, forging, cyaniding, lead hardening & oil tempering.

HOLCROFT & COMPANY
LEADERS IN BUILDING AND DESIGNING ELECTRIC AND COMBUSTION FURNACES, KILNS AND OVENS.
HOME OFFICE: DETROIT—BRANCHES: CHICAGO, PHILADELPHIA
CANADA: HIRAM WALKER & SON, METAL PRODUCTS, LTD., WALKERVILLE, ONT.
BUILT BY HOLCROFT & COMPANY DETROIT-MICH.
INVESTIGATE ELECTRIC HEAT

AUTOMATIC FURNACE EQUIPMENT — *Oil or Gas*
HARDENING, DRAWING, ANNEALING, CARBURIZING
McCann—Harrison Corporation
CLEVELAND, OHIO

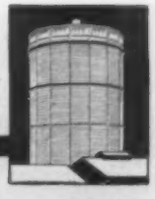
IF IT'S DONE WITH HEAT, **YOU CAN DO IT BETTER WITH GAS**

THE tunnel kiln has revolutionized many branches of the ceramic industry. Ten years ago tunnel kilns were practically unheard of; today hundreds are in use. And it is generally acknowledged that gas heat is in a large way responsible for the development of the tunnel kiln to its present state of efficiency.

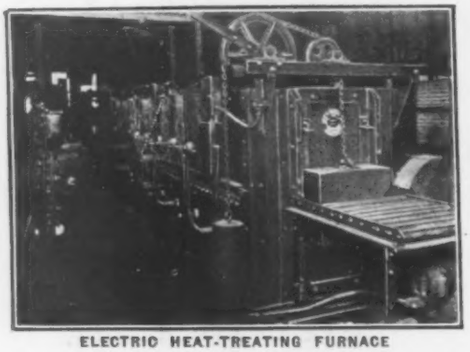
Tunnel kilns are essentially gas-burning equipment.

Send for your copy of the free book, "GAS HEAT".

AMERICAN GAS ASSOCIATION
420 Lexington Avenue, New York



ROCKWELL
FURNACES
ELECTRIC *and* FUEL



ELECTRIC HEAT-TREATING FURNACE

The above installation is another demonstration of the ever-increasing recognition of the merits of Rockwell Electric and Fuel Furnaces.

Only after thorough investigation of the heating problem had been made did the manufacturer decide upon the Rockwell Electric Furnace illustrated.

Let us show you how you, too, could use Rockwell Furnaces to advantage.

Write for Bulletin 281-Q

New York
Chicago

BETTER HEATING W. S. ROCKWELL CO. INDUSTRIAL FURNACES NEW YORK LOWER COST

Detroit
Montreal

Member of Industrial Furnace Manufacturers' Association

313

DRY-SYS Equipment includes:

Finishing Room Equipment for all wood and metal products; Drying and Baking Ovens with trucks, racks, conveyors, washers, etc.; Foundry Core Ovens; Dry Rooms for high or low temperature; Air Conditioning Equipment; Industrial Furnaces; Heating Units for gas, oil or steam.

Descriptive literature on request.

DRYING SYSTEMS INC.
1813 Foster Ave., Chicago, Illinois

GEHNRICH INDUSTRIAL OVENS

For Improved Performance

EMPLOYING ALL MODERN CONVEYING METHODS

JAPANNING. ENAMELING. CORES AND MOLDS. VARNISHED INSULATIONS. LOW TEMPERATURE HEAT TREATING. MANY OTHER APPLICATIONS. ACCESSORY EQUIPMENT.

GAS
ELECTRIC
OIL
STEAM

Write for descriptive literature

GEHNRICH OVEN COMPANY
Skillman Ave. and 55th St.
LONG ISLAND CITY, N.Y.

"American" Electric Furnaces
for every industrial purpose

Pot Type *Box Type* *High Speed* *Rotary Hearth*
Rotary Retort *Continuous and semi-continuous*

AMERICAN ELECTRIC FURNACE CO.
31 Von Hillern Street, Boston, Mass.

DRYING OVENS
WASHING MACHINES for METAL PARTS

We also make a complete line of Baking, Enameling and Lacquering Ovens. Write for information.

DETROIT SHEET METAL WORKS
1298 Oakman Blvd. Detroit, Mich.

SWINDELL FURNACES

FOR ELECTRIC MELTING, HEAT TREATING & ANNEALING FURNACES —OPEN HEARTH & CRUCIBLE STEEL MELTING FURNACES—HEATING AND ANNEALING FURNACES—GAS PRODUCERS — FURNACE REVERSING VALVES 21" to 48"

SWINDELL-DRESSLER CORPORATION
P.O. Box 1753 Pittsburgh, Pa.

Hoskins Products

Chromel

SALES OFFICES
New York, Grand Central Terminal
Chicago . . . . . Otis Building
Boston . . . . . Park Square Building
San Francisco . 1151 Market Street
Cleveland . . Leader-News Building

ELECTRIC FURNACES • HEAT RESISTANT ALLOYS • ELECTRICAL RESISTOR ALLOYS • PYROMETERS
HOSKINS MANUFACTURING COMPANY, 4445 LAWTON AVENUE, DETROIT, MICHIGAN

AMERICAN GAS FURNACE CO. — PIONEERS IN 1878 — LEADERS TODAY

Equipment for Hardening, Annealing, Casehardening, Tempering, Coloring, and for All Industrial Heat-Treating Operations. Bulletin I.A. 20 on request.

American Gas Furnace Co.
Elizabeth, N. J.

Moore Rapid Lectromelt Furnaces

Ten Standard Sizes ½ to 24 Tons Capacity
Most Rapid and efficient for making
Tool Steels, Alloy Steels, Forging Steels, Steel Castings, Malleable Iron & Gray Iron

PITTSBURGH ELECTRIC FURNACE CORPORATION
P.O. BOX 1125, PITTSBURGH, PA.

HAGAN

INDUSTRIAL FURNACES
for all purposes
GEORGE J. HAGAN CO.
PITTSBURGH, PA.
New York Detroit Chicago San Francisco

INDUSTRIAL FURNACES HAAN FOR ALL PURPOSES

26.9% cut from their fuel bill

★ with Insulation that paid for itself in less than 6 months

IF you walked into a hardware store and for $1.00 could purchase a device that would reduce your gas bill $2.42 a year, for years to come, you would buy it. This is substantially the ratio of saving which the Chicago Malleable Castings Company of West Pullman, Ill., accomplished by insulating two of their annealing ovens built last year.

By installing Johns-Manville Insulation in place of the outer course of fire brick on the walls and arches, and by insulating the base as well, they have reduced the consumption of fuel oil 21.4 gal. per ton of annealed castings, saving $876.56 in fuel per year, a net annual return of 242% on the investment.

These figures are based on careful comparative tests made with uninsulated ovens of similar design. The tests were conducted in collaboration with the chief engineer of the Chicago Malleable Castings Co.

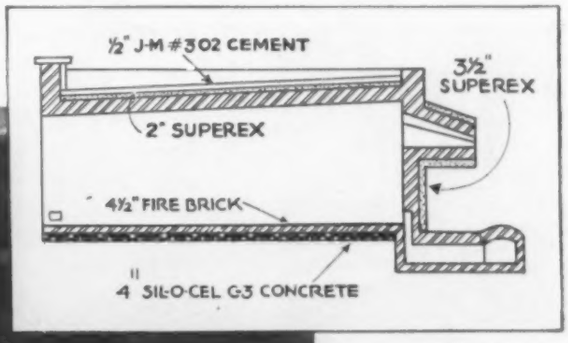
Besides saving fuel, J-M Insulation provides other advantages. Due to the low radiation losses from the insulated ovens, annealing temperatures can be more closely and more readily controlled. In addition, the cooling-off rate, which must not be faster than 7° F. per hour, is kept well within this figure by the blanket of insulation, so that re-firing to prevent *too* rapid cooling is not necessary.

The very noticeable reduction in the room temperatures surrounding the insulated units means more comfortable working conditions and an increase in personal efficiency.

Records of many installations such as this have shown that in most plants similar economies can be effected by correct insulation, properly applied.

The experience of J-M Insulation Engineers for any insulation problem is always at your service. It is offered freely and without obligation.

This oven is 14 ft. wide and 27 ft. long; it takes 32 tons of malleable castings per anneal. Annealing temperature is about 1550° F.



★This oven is insulated on the side and end walls with 3½" of Superex Blocks applied in two layers, 2" and 1½" thick, with broken joint construction. The side and end walls are metal encased.

The arch is insulated with a layer of Superex Blocks 2" thick, and ½" coat of J-M No. 302 Insulating Cement. The base is insulated with 4" of Sil-O-Cel C-3 Concrete.

Because of the results obtained, the Chicago Malleable Castings Company has approved plans to build four additional units similarly insulated.

JM PRODUCTS

Johns-Manville

INDUSTRIAL INSULATIONS

SUPEREX, SIL-O-CEL, 85% MAGNESIA, SPONGE FELT, ROCK CORK

For all temperatures from 400° F. below zero to the highest industrial temperatures

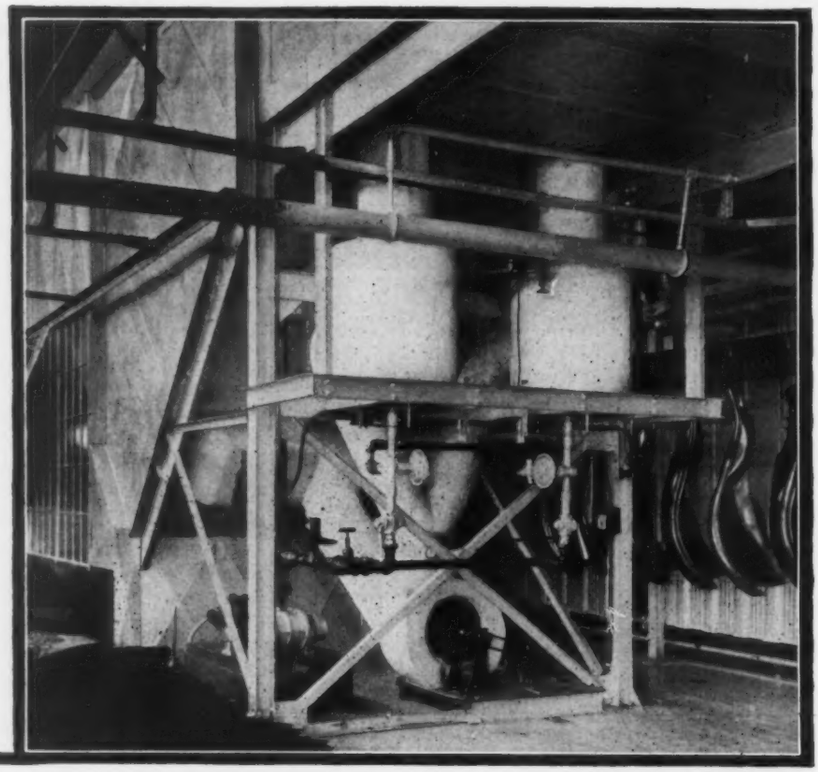
Address JOHNS-MANVILLE
At nearest office listed below
New York Chicago Cleveland New Orleans
San Francisco Toronto
(Offices in all large cities)

Please have a J-M Engineer call to discuss Insulation for our plant. 1-31-7

Name .....

Address .....

WHY A REMOTE HEATER FOR AN INDUSTRIAL OVEN?



THE remote type heater is one of several fundamental means used to satisfy economically the wide range of requirements encountered in oven heating. The remote heater effects the greatest economy of baking chamber space. Likewise, the greatest latitude of location is available, the heater being placed wherever it is most accessible for operation, supervision and maintenance. Nor is its design limited by the conditions or space within the oven structure.

It operates under the positive control of automatic temperature regulation and safety devices and is ideally suited to recirculation. Its fuel efficiency and operating costs depend upon the individual unit considered, for some heaters now on the market are very much more efficient than others.

The very efficient heater pictured here is located in a large metal finishing plant handling jobbing work on a highly competitive basis. It serves a continuous conveyor A-type oven operating at 475 degrees F. This unit heats up so rapidly that it is not necessary to start the heater until the conveyor is loaded and put in motion.

When you are faced with the problem of oven heating, get the impartial recommendation of Young Bros. Engineers, who are familiar with the advantages and limitations of all types of heaters and heating methods.

YOUNG BROTHERS COMPANY

6504 Mack Avenue . . . Detroit, Michigan

DISTRICT SALES OFFICES:

30 Church Street . . . . . New York
1323 Guarantee Title Bldg. . . . . Cleveland
432 Pennant Bldg. . . . . St. Louis
273 Seventh Street . . . . . San Francisco
908 Ellicott Square . . . . . Buffalo
20 East Jackson Blvd. . . . . Chicago
807 San Fernando Bldg. . . . . Los Angeles
248 Central Bldg. . . . . Seattle, Wash.
10 High Street . . . . . Boston, Mass.
Walker Metal Products, Ltd. . . . . Walkerville, Ont.
West Building . . . . . Houston, Texas
Brown-Marx Building . . . . . Birmingham, Alabama

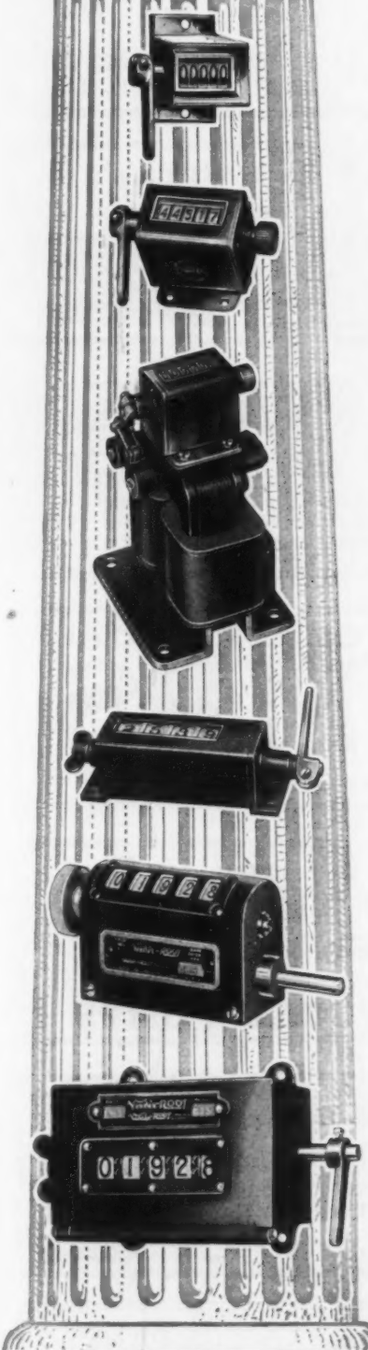
OVENS FOR

Core and Mold baking . . . Low temperature heat treating . . . Drying . . . Japanning and enameling . . . Electrical appliance baking . . . Adapted to all methods of heating.

YOUNG BROS. CO. OVENS — OUR BOLTLESS JOINT — DETROIT

INDUSTRIAL OVENS

Veeder-Root COUNTERS



Solid Support for ECONOMIES in Production

*

*

MUST you SAVE as never before? Then every unit of production must be counted—and accounted for.

Every ounce of metal fed into a machine must produce the number of finished pieces estimated.

Every hour of labor-cost must show equivalent output—by actual count.

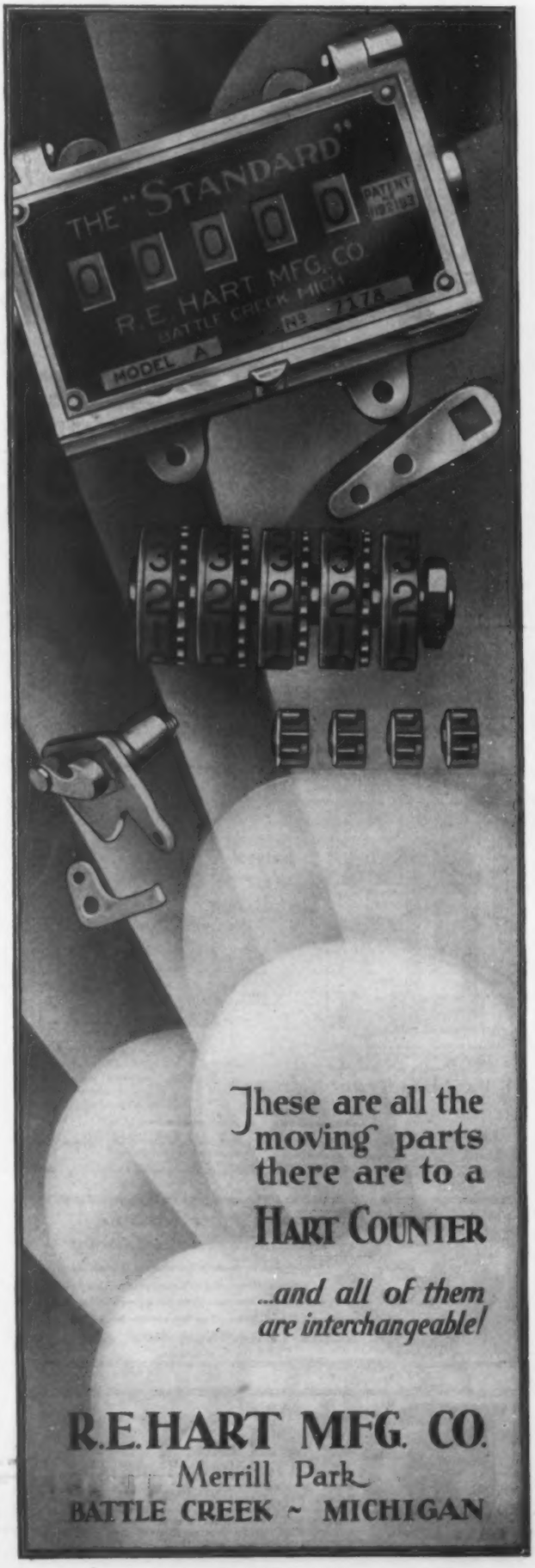
Every run must be stopped when completed; exact count made as the work comes through; over-runs and under-runs prevented.

These ways—and more—Counters support your economy-plans. What do they cost? They cost but a moment's thought; your machines promptly pay for the Counters—in YIELD. Your request brings Catalogue of the Counters needed.

*

Veeder-Root INCORPORATED HARTFORD, CONN.

OFFICES IN PRINCIPAL CITIES; WRITE OR PHONE



These are all the moving parts there are to a HART COUNTER

...and all of them are interchangeable!

R.E. HART MFG. CO.

Merrill Park

BATTLE CREEK ~ MICHIGAN

HARDNESS TESTING
Is Now Done Almost Exclusively With
The SCLEROSCOPE
(International Standard)

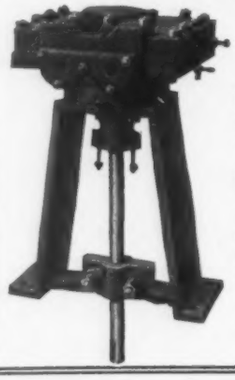
Direct reading, can be operated by anyone with great rapidity. Measures softest metals and hardest steels without special adjustment.

Send for our booklet, free.

Selective Carburizing. Localized Hardening by SHORR Process.

SHORE INSTRUMENT & MFG. CO., Inc.
Van Wyck Avenue and Carll Street, Jamaica, N. Y.
Agents in all Foreign Countries

Vertical Frame Air Motors



for Agitators, Mixers, Submerged Pumps, or

Other installations where vertical shaft is required. Furnished in non-reversing type with either right hand or left hand rotation. Also reversing type. Sizes 2 H.P. to 30 H.P.

DAKE Air Motors Have No Dead Centers

They start, stop and reverse instantly. Require no expert attendance and give lasting satisfactory service. Catalog on request.

DAKE ENGINE COMPANY
Grand Haven, Mich., U. S. A.

COUNTERS-PRODUCTIMETERS
FIGURE WHEELS PINION GEARS
"FOR EVERY PURPOSE"

FIGURE WHEELS

Write for Catalogue

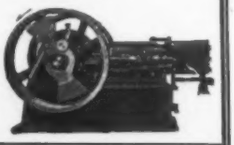
DIE CASTINGS

Send us your samples or blueprints for quotations. Castings made from tin, zinc, or aluminum alloys. We handle either plain or the most complicated castings.

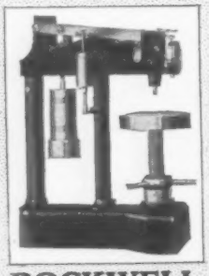
Revolution Counter

UNITED STATES FARE RECORDING CO., INC.
Home Office 512 West 54th St. New York City

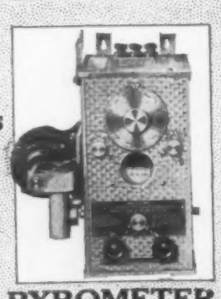
ONLY Steam Engines
Good Engines
ONLY
2 to 200 H. P.
Troy Engine & Machine Co.
Troy, Pennsylvania



PENNSYLVANIA
PUMPS and COMPRESSORS
Many models, many services, all to one standard of quality and suitable to every industrial need.
PENNSYLVANIA PUMP and COMPRESSOR CO.
MAIN OFFICE AND WORKS, EASTON, PA.



Send for Catalogs



ROCKWELL
Hardness Tester

PYROMETER
Controller, Indicator and Recorder
Both millivoltmeter and potentiometer types.

738 East 143rd St.
WILSON-MAEULEN CO. INCORPORATED New York

RoTURBo CENTRIFUGAL
PUMPS
Manistee Iron Works Co., Manistee, Michigan

MORRIS
Since 1864 we have been building Centrifugal Pumps, Hydraulic Dredges and Steam Engines. You can *depend* on all Morris equipment.
MORRIS MACHINE WORKS
BALDWINSVILLE, N. Y.
Agents in Principal Cities

CENTRIFUGAL PUMPS

ALLIS-CHALMERS A-C MILWAUKEE

Power, Electrical, and Industrial Machinery

Steam and Hydraulic Turbines · Steam Engines
Motors · Generators · Transformers · Switchgear
Centrifugal Pumps · Texrope Drives · Tractors
Crushing, Cement, Mining, Flour Mill and Saw Mill Machinery

ALLIS-CHALMERS MFG. CO.
MILWAUKEE, WIS., U. S. A.

HIGH PRESSURE VALVES and FITTINGS. Hydraulic Machinery.

ANKER ENGINEERING CO.
Widener Bldg. Philadelphia

De Laval
Steam Turbine Co., Trenton, N.J.

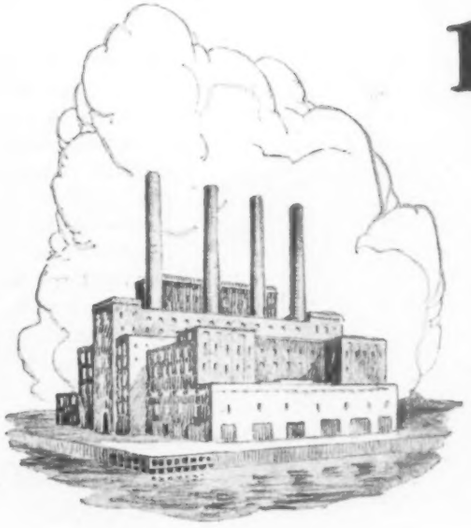
Steam Turbines for all speed and steam conditions.
Catalog D42. Double Helical Speed Reducing Gears.
Catalog G42 Centrifugal Pumps, for all capacities.
Catalog B42. Centrifugal Blowers and Compressors.
Catalog F42. Worm Gears, Catalog R42. Flexible Couplings, Catalog K42. Water Wheels. Catalog W 43.

INGERSOLL-RAND COMPANY
11 BROADWAY NEW YORK, N. Y.
Manufacturers of

Air Compressors	Cameron Pumps	Turbo Blowers
Diesel Engines	Pneumatic Tools	Condensers
Oil-Electric Locomotives		Rock Drills

Bulletins on Request

Where the gauge hand points to 1400 pounds



ONE of the most striking developments in Central Station practice was the adoption of 1200 pounds steam pressure for Edgar Station. Here indeed was Modern Steam, and the high pressure plants that followed proved that the idea of operating boilers at 1200-1400 lbs. pressure was sound and practicable.

It is natural that The Babcock & Wilcox Company should have been chosen to build the first 1200-1400 pound unit for Central Station Service. Natural because the first Central Station boiler to operate at 650 pounds pressure—a marked advance over previous pressures — was a B. & W.

To date there are 31 Babcock & Wilcox boilers either in service or in the process of manufacture that will deliver steam at 1200-1400 pounds pressure.

THE following Babcock & Wilcox boilers for 1200-1400 pounds pressure are in service or being made for the companies listed below:

American Gas & Electric Co. United Gas & Improvem't Co. Deepwater	6
W. S. Barstow & Company, Incorporated - Holland	2
Consolidated Safety Valve Co. Bridgeport	1
Edison Electric Illuminating Company of Boston - Edgar	5
Jersey Central Power & Light Company - South Amboy	3
Masonite Corporation - Laurel	2
Milwaukee Electric Railway & Light Company - Milwaukee	1
Pacific Gas & Electric Company - San Francisco	3
Phoenix Utility Company - Houston	2
State Line Generating Company - Hammond	6

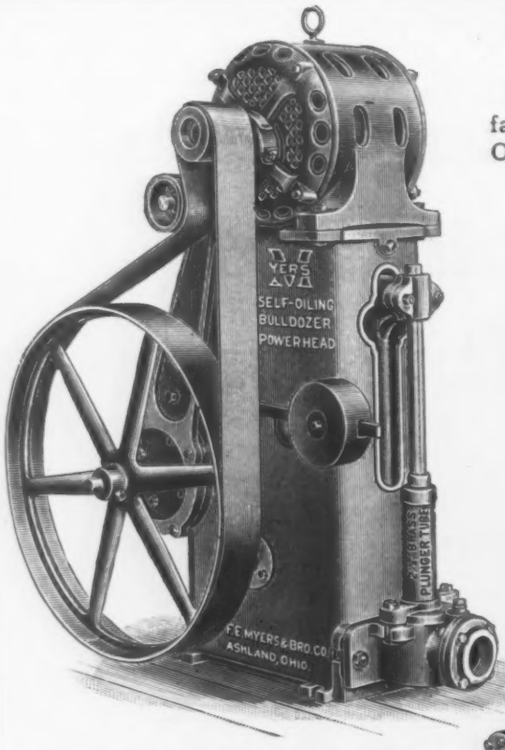
THE
BABCOCK & WILCOX
COMPANY

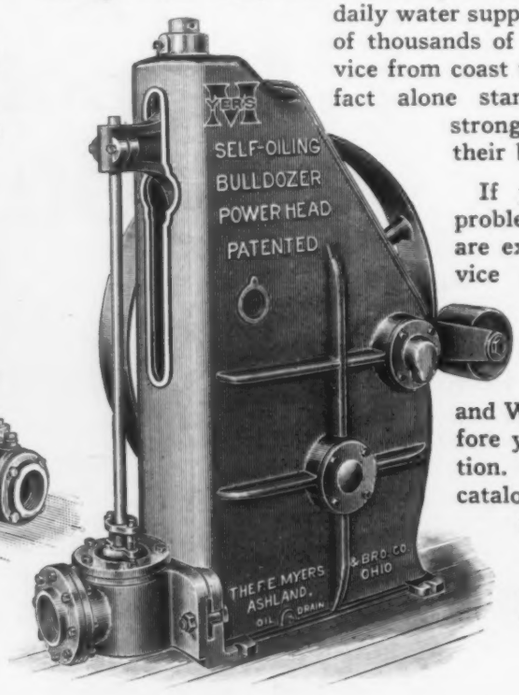
85 LIBERTY ST. NEW YORK, N. Y.

69

WATER PROBLEMS

From quiet homes and cottages to busy mills, mines and factories, under every imaginable condition, Myers Self-Oiling Power Pumps and Water Systems are pumping the daily water supply. Literally, tens of thousands of them are in service from coast to coast, and this fact alone stands out as our strongest testimonial in their behalf.





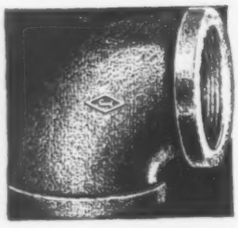
If you have water problems to solve and are exacting as to service standards, thoroughly investigate Myers Self-Oiling Power Pumps and Water Systems before you make a selection. May we send you catalog and complete information?

Take Off Your Hat To The MYERS
PUMPS · WATER SYSTEMS · HAY TOOLS · DOOR HANGERS

THE F. E. MYERS & BRO. COMPANY
ASHLAND, OHIO

★FITTINGS★

BY ★ JARECKI ★

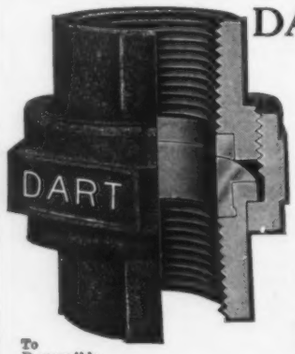


In specifying Jarecki Fittings you assure yourself of Fittings made by a manufacturer who for 78 years has specialized in the production of dependable products. Jarecki Fittings are structurally sound, have clean-cut threads and are thoroughly inspected before shipment.

A complete line assures a size and style fitted to your requirements. Inquiries will receive prompt and courteous attention.

Jarecki
MANUFACTURING COMPANY
ERIE, PA., U. S. A.

DART UNIONS



Two bronze-to-bronze seats accurately machined and carefully ground give double protection to the joint. Pipe ends and nut are heavy high grade malleable iron. Write for new price list and sample.

The Fairbanks Company, Sales Agents
Canadian Factory: Dart Union Limited, Toronto

To Responsible parties, samples on request.

E. M. Dart Mfg. Co.
Providence R. I.

BURY

AIR AND GAS COMPRESSORS
VACUUM PUMPS

ALL SIZES, ALL TYPES, ALL PRESSURES
TO MEET ANY ENGINEERING REQUIREMENTS

BURY COMPRESSOR CO., 1706 Cascade St. ERIE, PA.

There is no more

profitable way for a man to invest his time than to read the journal of his chosen field.

NOPAK
AIR OPERATING
VALVES

—the Valve with the throttling feature

CONTRARY to the general belief, the greatest loss of air or pressure in valves generally takes place in the open position, due to the leakage through the plug and other parts—this is eliminated in Nopak Valves.

The Nopak principle utilizes the pressure to assure a positive seal of valve parts. Lateral movement to pressure prevents shock, and permits openings practically equal to the area of the pipe line—giving unrestricted flow. Positive control permits small escapement of air, or an immediate opening of the full area. The pressure is against the valve at all times, holding the lapped surfaces of the disc and valve body definitely sealed.

Simple in construction; consisting only of three major parts—body, disc and cap.

Made in all standard sizes for air.

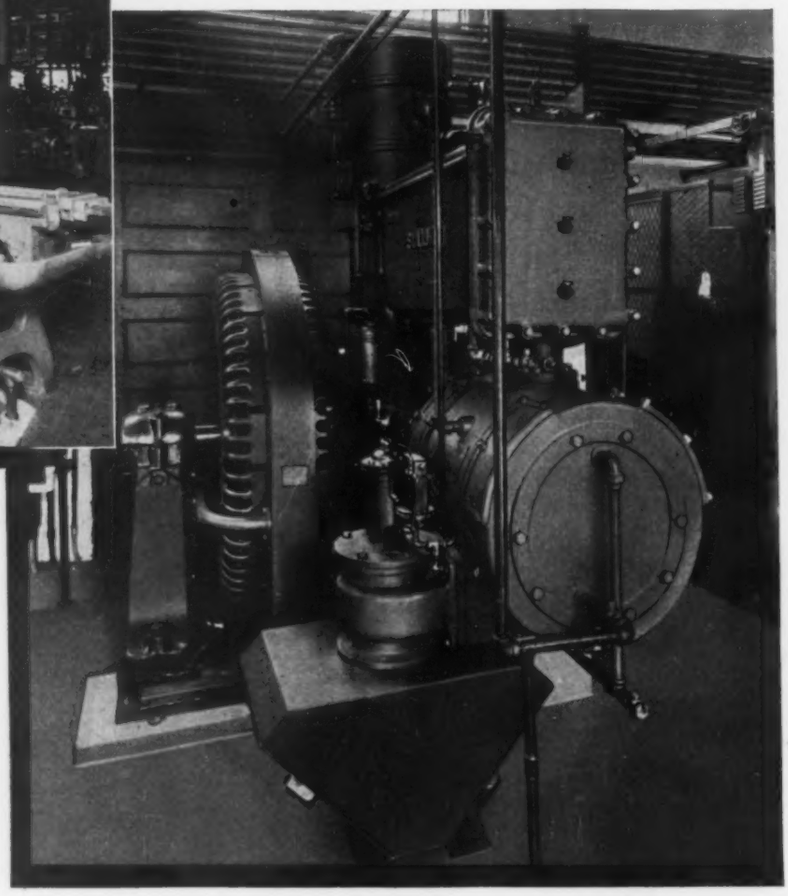
We Design and Build

Baling Presses
Nopak Air Valves
Angle Bending
Machinery

GALLAND-HENNING
MANUFACTURING COMPANY

1250-26th Avenue Milwaukee, Wis. Offices in Principal Cities

Leaders in every industry save with Balanced Angle Compressors



Balanced Angle Compressor in plant of world-famous builder of turret lathes, and machine tools. It is a 700-cu. ft. machine, direct-connected.

Compressed Air is reducing inventories

A few minutes clipped off a few operations, and off the waiting time between, may take a surprising slice from inventory. Shorter interval from raw material to finished product, is the call of the moment. And leaders are speeding tasks, and smoothing production lines, with compressed air.

This Balanced Angle air compressor was photographed in a 70-year-old New England plant where famous turret lathes, and many other machine tools are made on large scale.

Air hoists load and unload material, speeding handling between departments. Air jets at each machine blow out the chips and dirt. Air chucks speed lathe operations. Pneumatic chipping hammers, drills, grinders, sanders, paint guns, and numerous other air tools are reducing inventories for the manufacturing industries.

And, consistent with this search for economy, more and more executives are adopting Balanced Angle air compressors.

Compressor vibration has been reduced to zero by exact balance of reciprocating forces in the distinctive balanced angle machine commercialized by Sullivan Engineers.

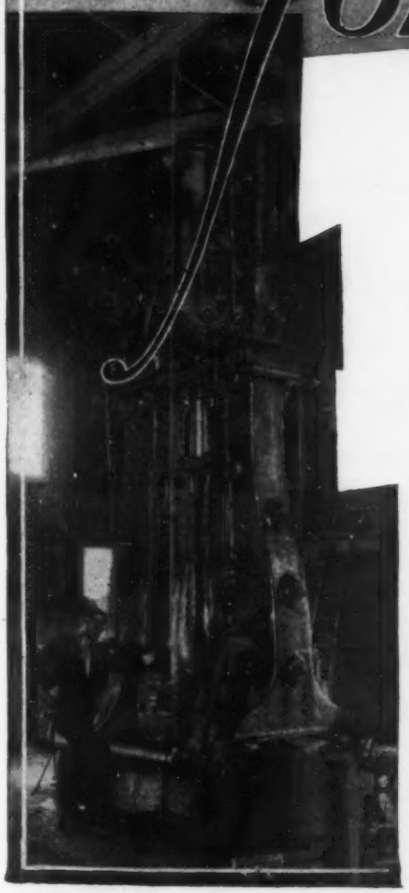
Capacities 300 to 5800 cubic feet.

Send for Booklet 83-J.

SULLIVAN TRADE MARK

Sullivan Machinery Company

821 Wrigley Bldg., Chicago, Ill. 30 Church St., New York, N. Y.



Forging Ahead with AIR

Compressed air is now being used in many shops to operate forging hammers — with decided advantages. When Westinghouse-National compressors supply the air, additional economy is realized.

Westinghouse-National compressors are economical in space occupied, in time and cost of installation, in power consumed (the start and stop method of control is used), and in maintenance expense, for they are built to endure. Motor driven types are available in sizes up to 700 cu. ft. displacement. The installation shown comprises five of the 3VS type, totaling 1600 cu. ft. A flexible governing arrangement permits operation of a single machine when air requirements are light, and starts the others successively as more air is needed.

Westinghouse Traction Brake Company
General Offices and Works: Wilmerding, Pa.

WESTINGHOUSE—NATIONAL
Air Compressors

"QUALITY MACHINES FOR QUALITY SERVICE"

The New Wood SB-10 Type GAS PRODUCER

This machine embodies the latest developments in full mechanical gas producers.

Increased gas making capacity, low power, steam and water consumption have been proven in actual every-day operation. Gas of the best quality is produced with the least amount of labor.

The main features of the type SB-10 Gas Producers are:

1. Full mechanical operation from the feeding of coal to removal of ashes.
2. Positive agitation of fuel bed by means of a single straight poker bar.
3. A water sealed, mechanical coal feeder without metal to metal contact between stationary feeder housing and multiple pocket feeder drum.
4. A revolving ash pan supported by three accessible conical rollers.
5. An adjustable ash plow permitting continuous plowing of ashes regardless of the amount of coal gasified.
6. A noiseless turbo fan blower insuring greatest economy in steam consumption, and perfect control of blast saturation.
7. Self-supporting construction.
8. A simple driving mechanism for continuous rotation of shell and agitating bar.
9. A simple layout of producer foundation requiring only about 15 cubic yards of concrete.

We will be glad to have our engineers call upon you to give full information regarding the details of construction and performance of this machine and arrange for its inspection in actual operation.

HYDRAULIC MACHINERY & OPERATING VALVES

R. D. WOOD & CO.

ESTABLISHED 1803

PHILADELPHIA, PA.

CAST IRON PIPE, HYDRANTS AND VALVES

Brass Pipe and Tube Fittings

Stock patterns are specially designed for connecting Brass and Copper Tubing

FORGINGS—ROD CASTINGS

Catalog I-30 on Request

Quotations on Specials on Receipt of Print or Sketch.

COMMONWEALTH BRASS CORPORATION
Commonwealth and G.T.R.R.
DETROIT

THE PRESIDENT SAYS.....

"One of our foremost policies has always been to make our plant a safe place in which to work."

"One of the big factors in maintaining this policy has been the Central Floor Plate."

"It prevents slipping."

This plate will do the same for you!

CENTRAL IRON & STEEL CO
Harrisburg, Penna.
Offices in all principal cities

If interested, send for sample and more detailed information on

CENTRAL "KNOBBY" NON-SKID FLOOR PLATES

REG. U.S. PAT. OFFICE — UNDERWRITERS' LABORATORIES INSPECTED F.A. 443

FELTS for every conceivable purpose—

Washers, Gaskets, Wicks, Pads, Strips, for lubricating, dustproofing, insulating, etc.

THE BOOTH FELT CO., Inc.
477-79 19th St. BROOKLYN, N. Y.
734 Sherman St. CHICAGO, ILL.

FELT for EVERY PURPOSE

All colors and styles, by piece, yard, etc., or cut to special shapes to meet your requirements.

Washers, Gaskets, Discs, Wicks, Strips, etc.
for Mechanical, Electrical, Automobile and other trades.

CONTINENTAL FELT CO.
890 BROADWAY, NEW YORK

FELT

manufactured and cut to exact specifications, 3 large factories, a cutting plant and nine branches; the utmost in service.

Blue prints—specifications—samples, send us one or all of them. We will then submit quotations and advise you of any savings that might be effected.

The FELTERS Co., Inc. *Manufacturers of Felts*

Boston, New York, Chicago, Detroit, St. Louis, Philadelphia, Cleveland, Los Angeles, San Francisco

KREOLITE FLOORS

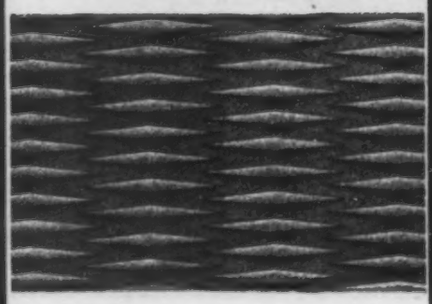
Block Grooved

"Outlast the Factory"

An excellent investment for machine shops, warerooms, foundries, pickling rooms and other parts of the plant where the floors receive hard wear. Write today for our booklet "Factory Floors."

THE JENNISON-WRIGHT CO., 80 Kreolite Bldg., Toledo, O.

The Perfect Diamond



THIS FLOOR PLATE REDUCES SLIPPAGE

Neverslip Floor Plates reduce the *probabilities* of slippage wherever they are used for Flooring, Walkways, Stair Treads, Traffic Lanes, etc . . . We do not say that even Neverslip can *eliminate* slippage—that is not humanly possible.

However, the clean-cut, sharp, flat-topped, perfect diamond pattern, rolled of fine open hearth steel, is as fine an "armor of safety" as can be devised. We ought to know—we have made Floor Plates for over 30 years! (We make two patterns, "The Perfect Diamond," and "The Ribbed.") *Write for Samples and Literature.*

AMERICAN PRESSED STEEL CO.
Commercial Trust Building—Philadelphia, Penn.

The Mark of a Pioneer

ILLINOIS FLOOR PLATE

Section M-41

Furnished to the following dimensions:

Thickness—3/16" to 3/4" exclusive of raised figure.
Weight—8.8 to 31.7 pounds per square foot.
Width—6" to 72".
Length—240" maximum for all gauges and widths.

This design drains and cleans readily and is recommended for all service where a safe footing is required.

Illinois Steel Company

Subsidiary of UNITED STATES STEEL CORPORATION

General Offices: 208 South La Salle Street, Chicago, Illinois

"A.W." *Diamond Pattern Rolled Steel* (Also in Aluminum)

FLOOR PLATE

Available in two patterns—"A. W." Diamond and "A.W." Diamondette. Write for samples and booklets.

ALAN WOOD STEEL CO.

Conshohocken, Pa.

Philadelphia New York Boston Dallas Seattle San Francisco Los Angeles

THE dividends produced by Scientific Management are many times greater than the initial cost of installation. And you have the satisfaction of knowing that production is being accomplished in a thorough manner by means of Scientific Management.

STONE, FRANCIS & HART

Industrial Engineers and Accountants

165 Broadway New York, N. Y.

HOGGSON BRAND HAND CUT STEEL STAMPS

FORMERLY "YALE BRAND"

The life of a stamp depends on the correct shaping and proper tempering.

Try the Hoggson Brand for stamps or Marking Dies of all kinds.

The Hoggson & Pettis Mfg. Co.
New Haven, Conn., U. S. A.

Century Wood Preserving Co.

SERVICE

All forest products treated with all standard preservatives by all standard processes

Address Inquiries to Nearest Office

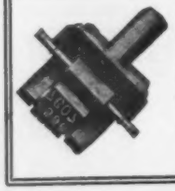
Pittsburgh—The Ohio Wood Preserving Co.; Pittsburgh Wood Preserving Co., Koppers Bldg.; The Maryland Wood Preserving Co.

Philadelphia—Delaware Wood Preserving Co., Finance Bldg.

Boston—New England Wood Preserving Co., Chamber of Commerce Bldg.

New York City—Delaware Wood Preserving Co., 30 Church Street.

Reed City—Michigan Wood Preserving Co., Reed City, Michigan.



NOBLE & WESTBROOK

Automatic Numbering Heads will prove economical

for serial numbering on parts made of steel, brass, wood, fibre, etc., such as name plates, metal tags, machine parts, etc. Made to order in any style or size of figures. Write for particulars.

THE NOBLE & WESTBROOK MFG. CO.

Manufacturers of Rapid Production Marking Machines, Steel Stamps and Marking Dies, Brass Checks, etc.

Hartford, Connecticut, U. S. A.

for the

HOT SPOTS!

There are plenty of "hot spots" in your plant all the year around—but when hot weather adds its strength-sapping blasts, production is bound to drop—and production costs are bound to go up.

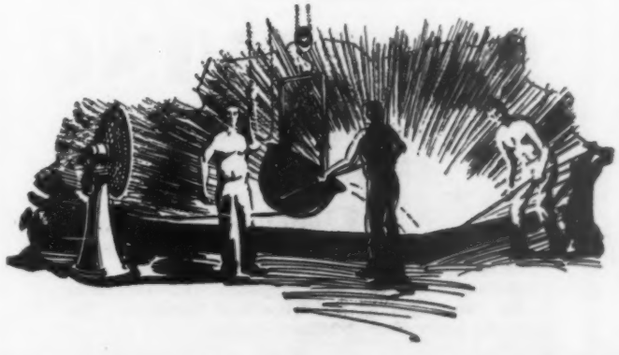
A Buffalo Breezo Cooling Fan at each of these "hot spots" will more than pay for itself in one season. You will not only make your employees comfortable and find more harmony among them but will help keep their minds alert and on the job—enabling them to do more work—better work.

Above illustration shows ten Breezo Cooling Fans recently sold to one plant. They are the huskiest, most efficient and economical "cooling" fans built. They are sturdily made throughout and will stand up under the most severe service.

Write today for prices and full details. Prompt shipment from stock.

BUFFALO FORGE COMPANY, 492 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



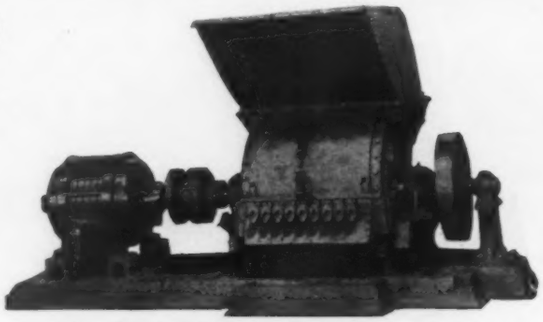
BREEZO COOLING FANS

Extra Profits?

Many shops and manufacturing plants are making extra profits by crushing their turnings into chips with American Ring Steel Turning Crushers. Chips not only bring a higher price, but they are easy to handle, require less storage space and are easier to ship.

Your long turnings will cease to be a nuisance after you put an American Ring Crusher on the job. It will pay for itself in a very short time, after which it will pay you a large weekly profit.

Do you want this extra profit?



No. 3800 American Ring Steel Turnings Crusher with hopper mounted on bed plate. (Patented)

AMERICAN Ring Crushers are crushing run-of-mine coal to stoker size at maintenance costs as low as 1/10 of a cent a ton.

ORIGINATORS OF THE ROLLING RING CRUSHER PRINCIPLE

American Pulverizer Co., St. Louis, Mo.

1249 Macklind Avenue

Let Us Bid For Your Seating Contract

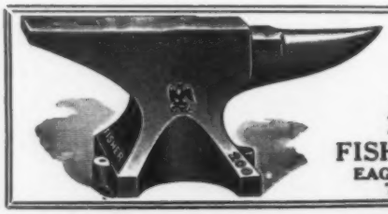
automatic adjustable **VITEK** Steel Stools

Before you let your seating contract, let us make a bid. Vitek offers many exclusive features . . . a patented locking device, which permits the seat to be raised to desired height by simply lifting it . . . all-steel construction, beautifully finished . . . 20 models to choose from . . . optional footrest and comfortable back . . . moderate prices Vitek Seating Equipment is ideal for mills, factories, offices, drafting rooms. Catalog gives complete information.

Send Now for New Catalog.

VITEK MANUFACTURING CO.

Dept. 401 Omaha, Neb.



"EAGLE" ANVIL

The First Guaranteed Anvil Made in U. S. A. Standard for 86 Years

FISHER & NORRIS

EAGLE ANVIL WORKS

TRENTON, N. J.

There's More Money in Crushed Turnings

The American Chip Crusher will reduce yours so economically and bring about such savings in oil, labor, space and shipping costs, that it will pay for itself in a few months. Write us for full particulars.

AMERICAN CRUSHER AND MACHINERY CORP.

853 Broadway, New York, N. Y.

Angle Steel Equipment

for Factory Shop and Office

No. 280 Factory Posture Chair

Angle and Sheet Steel

Stools — Chairs — Desks — Bench Legs — Tables — Benches — Cabinets — Trucks —Machine Tenders—Bins—Pans.

Write for Catalog "C-IA" on your letterhead

Agents and Dealers in Principal Cities

Angle Steel Stool Co., Plainwell, Mich.

Send for Catalog

SOMETHING

of interest to you in the Classified Sections

PRODUCTION executives, engineers, salesmen, used machinery, surplus materials, industrial real estate, contract work facilities, business opportunities, etc.—all these are advertised in the Classified Sections. *See pages preceding Products Index.*

THE CLASSIFIED SECTIONS OF THE IRON AGE

In this busy Metal Working INDUSTRY

some one
always
wants to
BUY

some one
always
has the
MATERIAL

some one
always
wants some
HELP

some one
always
has the
MONEY

some one
always
wants a
MAN

THE CLASSIFIED SECTIONS FILL A VITAL NEED

1

Tell him what you have in the
CLEARING HOUSE SECTION

2

Tell him your requirements in the
WE WANT TO BUY SECTION

3

Tell him your facilities in the
CONTRACT WORK SECTION

4

Tell him the investment you afford in the
BUSINESS OPPORTUNITIES SECTION

5

Tell him your qualifications in the
EMPLOYMENT EXCHANGE

THE CLASSIFIED SECTIONS

SIMMONS "RESTORED" MACHINES

A few selections from our stock of 2,000 guaranteed "Restored" machines

GEAR CUTTERS

1—No. 6 Fellows Gear Shaper
2—6" Gleason Generators
1—15" Gleason Generator
9—18" Gleason Generators
1—24" Gleason Planer
1—77" Gleason Planer
1—No. 1 Standard Auto
1—No. 2-B Newark Spur and Bevel
1—No. 13 Brown-Sharpe
1—36" Gould-Eberhardt
1—60" Brown-Sharpe
2—96" Pratt-Whitney
2—No. 3 Barber-Colman
1—No. 5-A Lees-Bradner Hobber
1—12-H Gould-Eberhardt Hobber
1—No. 12 Barber-Colman Hobber
1—96-H Gould-Eberhardt Hobber
1—48" Gould-Eberhardt Rack Cutter

GRINDERS

1—No. 2 Peerless Horizontal
1—No. 1 Besly Disc
1—No. 2 Besly Disc
1—No. 10B, No. 16G, Besly Disc
1—No. 4 Gardner Disc
1—No. 2 Brown-Sharpe Surface
1—No. 3 Brown-Sharpe Surface
1—No. 2 Reed Surface
2—No. 16 Blanchard Surface
1—No. 4 Springfield Planer Surface
1—No. 5 Diamond Surface
1—Williams Vertical Cylinder
1—No. 60 Heald Internal
1—No. 70 Heald Internal
1—4x30" Pratt-Whitney Cylinder
1—No. 10 Brown-Sharpe Plain
1—6x20 Landis Plain
1—10x30 Brown-Sharpe Plain
1—10x72 Norton Plain
1—12x36 Cincinnati Universal
1—12x48 Modern Plain
1—12x48 Modern Universal
1—14x50 Norton Plain
1—14x72 Norton Plain
1—18x96 Norton Plain
1—16"x48 Landis Crank
1—No. 1 Fraser Universal
1—No. 3 Brown-Sharpe Universal

BORING MILLS

1—No. 3-A Universal Precision
1—No. 0 Bement Knee Type Horiz.
1—No. 0-D Harvey 3½" bar
1—60" N-B-Pond Duplex Control
1—4½" Bar N-B-Pond Floor Type
1—No. 3 Betts Horizontal
1—No. 3 Barrett Horizontal
1—Espen-Lucas 6' bar, Horizontal
1—Newton 7" bar, Horizontal
1—24" Bullard Rapid P. Vert.
1—34" Bertram Turret Head
1—30" Bullard Vertical
1—34" Colburn Vertical
1—37" Bridgeport Vertical
1—42" Bullard Rapid Traverse
1—42" Bullard Vertical
1—42" Gisholt Rapid Traverse
2—44" N-B-Pond Rapid Traverse
1—44" Putnam Rapid Traverse
1—62" N-B-Pond Rapid Traverse
1—96" N-B-Pond Motor Drive
1—100" Sellers Rapid Traverse
1—7-10' Betts Vertical
1—10-16' Niles Rapid Traverse
1—12' Niles Rapid Traverse
1—14' Niles Rapid Traverse

AUTOMATICS

4—No. 00 Brown-Sharpe
1—No. 0 Brown-Sharpe
1—No. 2 Brown-Sharpe
2—No. 2G Brown-Sharpe
1—No. 6-A Potter-Johnston
2—No. 7-A Potter-Johnston
1—⅜—½" Cleveland Model A
2—⅞—1 1/16 Cleveland Model A
18—¾" Gridley four spindle
5—⅞" Gridley four spindle
2—1¼" Gridley four spindle
1—1¾" Gridley four spindle
1—2¼" Gridley four spindle
1—2⅝" Gridley four spindle
7—2¼" Gridley single spindle
1—2"—2½" Cleveland
6—3¼" Gridley single spindle
4—14" Fay Automatic Short Bed
2—14" Fay, Flanders Type

LATHES

1—8x60 Lo-Swing
1—12"x5' Sidney
1—13"x6' Pratt-Whitney
2—14"x6' Hendey Tool Room
1—14"x6' Monarch
1—14"x10' Pratt-Whitney
1—16"x6' Monarch
1—16"x6' American
1—16"x6' Springfield Tool Room
2—16"x6' LeBlond
1—16"x8' Monarch
1—16"x8' Springfield
2—17"x6' LeBlond
1—17"x10' LeBlond
1—18"x8' LeBlond
1—18"x8' Lodge-Shipley
1—18"x12' Lodge-Shipley
1—20"x10' Bradford
1—20"x12' LeBlond
1—20-42"x6' Fay-Scott Gap
1—20"x10' LeBlond
1—24"x10' LeBlond
1—24"x12' Prentiss
1—25"x10' LeBlond
1—25-41x18' Harrington Gap
2—26"x12' N-B-Pond
2—30"x10' American Geared Head
4—30"x12' American Geared Head
1—30"x20' American Geared Head
1—36"x14' Bridgeford, Motor Drive
1—42" N-B-Pond Double End Wheel
1—42"x24' N-B-Pond
1—42"x28' N-B-Pond, Motor Drive
1—42"x30' Putnam, Motor Drive
1—48"x14' Pond, Motor Drive
1—48"x24' N-B-Pond, Motor Drive
1—50"x34' Pittsburgh
1—50"x36' Pittsburgh
1—60"x21'6" Pittsburgh
1—72"x58' N-B-Pond
1—90" Putnam Wheel Lathe
1—110"x39' Bement Heavy Duty.

SHAPERS AND SLOTTERS

1—16" Stockbridge
1—16" Milwaukee
1—20" Hendey
1—20" Kelley
1—20" Gould-Eberhardt
1—20" Steptoe
1—24" Simmons
1—24" Stockbridge, M. drive
1—24" Steptoe Shaper
1—26" Smith-Mills Shaper
1—15" Dill-Slotter
1—15" Newton Slotter
1—15-18" Dill Slotter
1—18" Dill Slotter
1—20" Bement Slotter
1—22" Bement-Niles Slotter

MILLERS

1—No. 0 Fox Hand
2—No. 6 Whitney Hand
1—No. 1 Pratt-Whitney Hand
1—No. 3 Garvin Hand
1—No. 2 Pratt-Whitney Column
1—No. 2 Garvin Duplex
1—No. 3 Garvin Duplex
1—No. 3½ Pratt-Whitney Duplex
1—No. 7-H Becker-Lincoln Type
1—No. 3 Lees-Bradner Thread
1—4½x12 Pratt-Whitney Thread
1—12" Pratt-Whitney Automatic
1—18" Cincinnati Automatic
1—24" Cincinnati Automatic
1—24"x24"x12' Ingersoll Adj. Rail
1—28x28x10' Ingersoll
1—32x28x16' Ingersoll
1—40x22x6' Ingersoll
1—48x36x14' Ingersoll Adj. Rail
1—56x40x12' Newton Horizontal
1—59x20x12' Ingersoll Slab
2—66x62x15' Ingersoll Planer Type
1—72x72x24' N-B-Pond Slab
1—No. 1 Bement-Smith Keyseat
1—No. 1-B Fox Plain
1—No. 1 Oesterlein Plain
1—No. 1-A Milwaukee Plain
1—No. 1½-A Milwaukee Plain
1—No. 1½ Brown-Sharpe Plain
1—No. 2-C LeBlond Plain
1—No. 34 Ohio Plain
1—No. 3-B Milwaukee Plain
1—No. 3 LeBlond Plain
1—No. 3 Cincinnati Plain
1—No. 4 Cincinnati Hi-Power
1—No. 5 Cincinnati Hi-Power
1—No. 2 Kempsmith Universal
1—No. 3 Cincinnati Hi-Power Vert.
4—Model SD Becker Continuous
3—Model CS Becker Continuous
1—No. 5 Becker Vertical
1—No. 5-B and S Vertical
1—No. 20 Garvin Vertical
1—No. 2 Knight Milling and Drilling

SOLD UNDER MONEY BACK GUARANTEE—ASK FOR OUR CURRENT STOCK LIST

SIMMONS MACHINE TOOL CORPORATION

BUFFALO, 601 Morgan Bldg. ALBANY, 1700 Troy Road NEW YORK, 149 Broadway

ReMANUFACTURED MACHINE TOOLS (ORIGINATED BY US)

ECONOMICAL TO BUY AND TO USE

LATHES

1—66"x21' Putnam, Tri. Grd.
1—54"-62"x23' Pond, M.D.
1—48"x50' Pond, 2 carriage.
1—45"x24' Pond, Tri. Grd.
1—36"x14' Johnson, M.D.
1—36"x12' L. & S., Sel. Hd.
1—36"-34"x12' L. & S.
10—26"x20', 18', 16' Bridgeford.
40—26"x18', 14', 10' N.B.P.
3—26"x12' Putnam, M.D.
25—26"x14', 12', 10' Bridgeford.
9—25"x12' Leblond.
1—24"x16' L.&S., Sel. Hd.
1—24"x16' Cisco.
1—24"x16' L.&S., Sel. Hd.
1—24"x12' American.
2—20"x18', 16' Monarch.
20—20"x20', 16', 12', 8' Amer.
2—20"x10' LeBlond, Gd. Hd.
1—20"x8' Lodge & Shipley.
2—18"x12' Reed-Pren., Gd. Hd.
1—18"x10' Lodge & Shipley.
3—17"x6' LeBlond Mfg.
2—16"x12', 6' Monarch.
2—16"x12', 10' Sundstrand.
1—16"x6' Reed-Pren., Gd. Hd.
1—16"x8' Hendey.
5—16"x6' Lodge & Shipley.
1—16"x6' L. & S., Sel. Hd.
1—14"x12' LeBlond, Gd. Hd.
1—14"x10' Pratt & Whitney.
2—14"x6' Lodge & Shipley.
2—14"x6', 7' Reed-Pren., G.H.
1—14"x6' Monarch.
2—13"x6' Willard.
5—3½"x60", 108" Lo-swing.
4—14" Fay Automatic.

MILLING MACHINES

1—No. 5 Cincinnati, late.
2—No. 5-B Becker-Brainard.
13—No. 4, 3, 2, 2-M, 1 Cin.
14—No. 5-B, 3-B, 2, 1-B, 1, 0 Brown & Sharpe.
2—No. 2-B, 1-B Milwaukee.
1—No. 21 Brown & Sharpe.
1—No. 2, 1 Kempsmith.
2—No. 20 Oesterlein.
1—No. 1½ Rockford.
7—No. 25 Becker.
1—No. 3 Kempsmith Univ.
1—No. 2-M Cincinnati Univ.
1—No. 3-S Cincinnati Univ.
1—No. 1 Kempsmith Univ.
1—No. 20 Oesterlein Univ.
11—No. 6, 5, 4-B, 1 Beck, Vert.
1—No. 4 Cincinnati Vert.
1—No. 5, 2 B.&S. Vert.
1—No. 3 Sundstrand Rigidmill.
3—Type B Briggs Mfg.
5—48", 24", 18" Cin. Auto.
3—No. 33 Kempsmith Mfg.
175—P.&W., Hendey, Becker and Garvin Lincoln Millers.
1—24x13"x20' Ingersoll.
2—24x24"x12' Ingersoll.
1—36x30"x7' Newton.
1—45"x17½' Ingersoll.
1—50"x20' Ingersoll.
1—No. 3, 92x54"x15' Beaman & Smith Planer Type.
1—Beaman & Smith Open Sd.
1—3-spdl. Beaman & Smith.

GEAR CUTTERS

1—No. 5—60" Brown & Sharpe.
3—No. 3, 26" Brown & Sharpe.
2—No. 36-H Gould & Eberhardt.
10—No. 12, 3 Barber-Colman.
5—No. 6, 61 Fellows.
1—No. 18H G. & E.
1—No. 36-BM G. & E.
1—12x24" G. & E.
1—12x10" G. & E.
1—No. 1 Schuchardt & Schutte.

BORING MILLS

1—10' Niles Vertical.
1—96" Betts Vertical.
1—72" Pond Vertical.
1—62" N.-B.-P. Vertical.
1—61", 51" Baush Vertical.
1—60" Pittsburgh Vert.
1—54", 51" Bullard Vert.
5—52", 42", 36", 30" Gisholt.
2—48", 42" Colburn Vertical.
2—44" Putnam Vertical.
2—42" King Vertical.
1—36" Bullard Rapid Prod.
2—32" King Vertical.
1—30" Flather Vertical.
1—No. 1 Cleveland Hor.
1—No. 5—3" bar Defiance.
1—3" bar Rochester Hor.
1—5" bar Ingersoll Hor.
1—5" bar N.-B.-P. Floor.
1—2-spdl. Espen-Lucas.
2—No. 3 Barnes Hor. Radial.
4—No. 1 Barrett Horizontal.
3—No. 2 Rockford Horizontal.

GRINDERS

1—26x37½x96" Norton.
1—18x96" Norton.
1—16x52" Landis.
1—16x48" Landis Crank Pin.
9—14x72", 50", 36" Norton.
2—12x36" Modern.
22—10x72", 50", 36", 24" Nor.
7—10x72", 52", 36", 24" Land.
1—40" Bryant Wide Wheel.
2—No. 12, 8x36" B.&S.
5—6x32" Norton.
1—5x18" Ott.
1—No. 2, 2½ Universal.
2—No. 1 Landis Universal.
1—No. 1 Modern Universal.
9—No. 60, 70 Heald Int.
1—No. 10-A, 20 Bryant Int.
1—14" P.&W. Vert. Surf.
2—12", 8" Heald Rotary.
1—8" Arter Rotary Surf.
1—84" Diamond Face.

TURRET LATHES

3—26", 18" Libby.
26—24" Davis.
8—24" Steinle, S.P.D.
8—24", 21" Gisholt.
1—No. 3 Cincinnati-Acme.
4—No. 4-A, 3-A, 2-A W. & S.
1—21x8' LeBlond Univ.
2—No. 6 Brown & Sharpe.
3—3x36" Jones & Lamson.
3—2-spdl. Jones & Lamson.
1—16" Cincinnati-Acme.
2—14" Warner & Swasey.
1—No. 33 New Britain Auto.
11—No. 5-A, 6-A P. & J.
4—14" Fay Automatic.

DRILLS

1—6' Cincinnati-Bickford.
1—6', 4' Reed-Prentice.
1—5" N.-B.-P. Universal.
1—4' Hammond.
1—2½" Gang, Geared.
2—1, 2-spdl. Sipp.
6—3, 2, 4, 6-spdl. H. & W.
8—1, 3-spdl. Leland-Gifford.
2—5, 1-spdl. Avey.
8—4, 3, 2, 1-spdl. No. 2 Colburn.
3—No. 17, 4, 2 4-spdl. F-B.
2—No. 14, No. 12 Natco Mult.
4—No. 14, No. 26-AC, No. D, 31 Fox.
2—No. 2, No. 3 Western Mult.
3—No. D-4 Colburn.
4—No. 25, 36", 24" F.-B.
1—25", 21" Weigle.
1—28" Hoefer.

PLANERS

1—72x84"x12' Gray.
1—60"x48"x12' N.-B.-P.
2—56"x56"x32', 16' Cin.
2—48"x48"x16', 10' N.-B.-P.
1—48"x48"x10' Gray.
2—36"x36"x18' Cincinnati.
2—36"x36"x16' 8' Ohio.
1—36"x36"x16' N.-B.-P.
1—36"x26"x10' Whit.-Blais.
1—36"x32"x8' Cincinnati.
1—30"x30"x14' N.-B.-P.
1—26"x26"x10' Gray.
2—24"x24"x6' Gray.
1—24"x24"x6' Fisher.
2—24"x24"x6' W. & P.
1—24"x24"x6' American.

SCREW MACHINES

1—No. 10-3" Bardons & Oliver.
3—No. 8 3⅝" War. & Swasey.
2—No. 6-2¼" Warner & Swasey.
1—1½" Millholland.
3—1" Pratt & Whitney.
1—No. OG B. & S. Auto.
3—No. 52 Nat. Acme Auto.
1—1"x5" 6-spdl. New Britain.
5—1¼" 4-spdl. Gridley.
2—2¼" 1-spdl. Gridley.

PRESSES

1—No. 54 Bliss.
1—No. 4 Walsh, O.B.I.
1—No. 4½ B. & K.
2—No. 203 Bliss S. S.
1—No. 10 Zeh & Hahnemann.
1—No. 5T Toledo Nosing Pr.
5—No. 58 Toledo Nosing Pr.
1—No. 30-G-32 Cleveland Gap.
1—No. 91-B Toledo S.S.
1—No. 201-C Toledo Gap.
1—No. 201-C Spec. Toledo Gap.
1—No. 203-B Toledo Gap.
1—No. 307 Bliss S.S. 9" str.
1—No. 5-C Bliss S.S.
1—No. 545½ Hamilton S.S.
1—No. 202-C Toledo Gap.
1—No. 91D Toledo S.S.
1—No. C-16 Ferracute O.B.I.

MISCELLANEOUS

1—No. 1 Garvin Tapper.
1—3¼" Hendey Centering.
1—Type "PJ" Oilgear Assembling and Forcing Press.
10—No. 1 Garvin Profilers.
15—Betts Profilers.
1—No. 12 P.&W. 2-spdl. Prof.
1—15" Dill Slotter.
1—24" Niles Grd. Slotter.
4—12", 8", 6", 4" B. & K. Pipe.
1—No. 1 LaPointe Broach Mach.

SOLD UNDER MONEY-BACK GUARANTEE

HILL, CLARKE & CO.

647 Washington Blvd.
CHICAGO
Phone—Haymkt. 7660

ADVANCE NOTICE

By Order of the
STEARNS MOTOR MANUFACTURING COMPANY

We will sell at

PUBLIC AUCTION

The entire Real Estate, Machinery and Equipment of THE STEARNS MOTOR MANUFACTURING COMPANY, manufacturers of "High-Grade 4 and 6 Cylinder Motors," located at LUDINGTON, MICHIGAN, on:

WEDNESDAY and THURSDAY, JULY 16 and 17, 1930

The sale will consist of the following:

The Real Estate on the shores of Lake Michigan containing over ten acres, on which stand buildings with a total floor space of 125,000 square feet.

A COMPLETE FOUNDRY AND PATTERN SHOP

The machinery consists of a complete line-up for manufacturing heavy duty four cylinder and six cylinder motors such as: Ingersoll Mills up to 48" wide; Natco and Fox Multiple Spindle Drills; Bullard 24" and 36" Vertical Turret Lathes; Cincinnati, Brown & Sharpe and Milwaukee Millers; Avey and Cincinnati Drill Presses; Norton and Brown & Sharpe Grinders; American, Wickes and LeBlond Lathes; Heald Cylinder Grinders; American and Cincinnati Radial Drills; Warner & Swasey Plain and Universal Turret Lathes.

SPECIAL NOTICE

Most of the Machines are arranged for direct motor drive with motors: 220 volts, 60 cycle, 3 phase.

The complete tool room includes: Cincinnati Plain and Universal Mills; American and Hendey Lathes; Brown & Sharpe Grinders; Giddings & Lewis Horizontal Boring Mill; Shapers; Drill Presses, etc.

Approximately $50,000 worth of small tools will be included, consisting of new and used drills, reamers, taps, chucks, vises, etc.

The scrap includes over 1500 tons of gray iron, charcoal iron, pig iron, bronze, brass, aluminum and white metal, together with bar stocks of steel and bronze.

A complete assortment of office furniture and fixtures and shop furniture and appliances will be included.

Also there will be offered thirty brand new Stearns "Extra Reserve" 4 and 6 cylinder motors, all complete with reverse gears, ranging from 70 to 140 H. P.

Machinery, equipment, small tools and office furniture will be offered in parcels only.

The foundry and pattern shop will be offered in bulk, subject to the parcel bids.

A complete detailed auction catalog is now being prepared. For catalog and any further information apply to

JAMES E. F. MOORMAN, Liquidator
1950 EAST ATWATER STREET, DETROIT, MICHIGAN, CADILLAC 1688
and
SAMUEL L. WINTERNITZ AND COMPANY, Auctioneers
38 SOUTH DEARBORN STREET, CHICAGO, ILLINOIS

THE PLANT IS NOW OPEN FOR INSPECTION

BARGAINS!

MILLERS

No. 4 Cincinnati $600
No. 3 Cincinnati $300
No. 2A Brown & Sharpe Universal..$675
No. 6 Becker Vertical $1750
No. 2 Bilton Auto. Gear Miller....$250

LATHES

14" x 6' Seneca Falls $150
16" x 8' Lodge & Shipley QCG....$250
18" x 8' Williams, Semi QCG.....$250
22" x 10' Davis QCG.....$675
24" x 12' Leblond $600

DRILLS

20" Champion, BG, PF.....$100
22" Barnes, BG, PF, SH.....$225
24" Cleveland, BG, PF, SH.....$275
26" Rockford, BG, PF, SH.....$325
3' Morris Radial $300
3½' Bickford Radial $475

MISCELLANEOUS

24" x 24" x 8' Cincinnati Planer..$250
42" x 42" x 10' New Haven Planer..$750
26" Cincinnati Auto. Gear Cutter..$250
1" National Threader & Dies.....$250

MILES
MACHINERY COMPANY
SAGINAW, W.S.
MICHIGAN

95%

Modern Latest Design Millers, Punch Presses, Drills, Shapers, Lathes
and other tools in our stock

No. 2 B & S Cone Drive Universal Miller with slotting attachment.
No. 2 AVEY Single Spindle Drill.
16" AMERICAN Auto-Oiled Motor Drive Shaper.
20" G & E Single Pulley Drive Shaper.
14"x8' AMERICAN Motor Drive Lathe.
15—No. 0 VERSON Bench Power Punch Presses on table and legs.
5—No. 1 LOSHBOUGH-JORDAN O.B.I. Punch Presses.
3—No. 2 LOSHBOUGH-JORDAN O.B.I. Punch Presses.
5—No. 4 LOSHBOUGH-JORDAN O.B.I. Punch Presses.
No. 7-A NIAGARA Geared O.B.I. Punch Press M.D.
No. 19, No. 20 and No. 21 BLISS O.B.I. Presses M.D.

OUR LATEST LIST UPON REQUEST. WHAT ARE YOUR REQUIREMENTS?

THE E. L. ESSLEY · MACHINERY · CO.
551 W. Washington Blvd., Chicago, Ill.
78-80 W. Water St., Milwaukee, Wisc.

New 3 phase motors 1 to 15 H. P.
5 H. P., $65.50

Boring Mill, No. 3 Colburn, Vertical.
Compressors, 6x5, 6x6, 8x8.
Drill, Baush, 5' radial.
Drill, Hilbert, 3' radial.
Drill, No. 66 D Moline Hole Hog, 7 spindle.
Drills, 24", 26", 28", and 32" sliding head.
Furnace, Weco elec. oven.
Gear Cutter, No. 13 Brown & Sharpe.
Grinders Surface No. 1 and No. 78 W. & M.
Grinder, 6"x15" Fitchburg, plain.
Grinder, 12"x36" Cincinnati Universal.
Grinder, 16"x48" Landis Universal.
Lathe, 13"x6' Willard quick change.
Lathe, 14"x6' Monarch, quick change.
Lathe, 15"x8' Sebastian, motor drive.
Lathe, 20"x10' Hamilton, new model.
Lathe, 20"x10' American, geared head.
Lathe, 24"x24' Prentice.
Milling Machines, 24"x20"x8' Ingersoll horizontal.
Milling Machines, No. 2 Bilton (2).
Milling Machine B. & S. No. 2 heavy.
Miller, Becker No 7.
Miller, No. 2 Kempsmith plain, new.
Planer, 24"x24"x6' American, 1 head.
Planer, 36"x36"x12' Gray, extra heavy, 4 heads.
Planer, 36"x36"x14' Gray, two heads.
Planer, 42"x42"x12' Gray, two heads.
Presses, Federal open back inclinable.
Presses, Nos. 1, 1½, 2 and 4 Robinson.
Punch and Shear, ⅝"x⅝", 10" throat.
Screw Machine, Defiance No. 4.
Screw Machine, Milholland 1" and 1⅛".
Shaper 16" American Back Geared Crank.
Shaper, 16" O. & S., new.
Shaper, 24" O. & S., cone drive.
Shear, No. 302 Robinson square.
Shear, square 60" Pexto, 18 gauge.
Shear, No. 20 Quickwork, 14 gauge, 20" throat
Shear, No. 12 Pettingell, 60" throat.
Washing Machine, Blakeslee.

THE OSBORNE & SEXTON MACHINERY COMPANY
COLUMBUS OHIO

Potter & Johnston No. 6-A Automatic S. & S. Hobbing Machines 36" and 48" Gleason 3" Generator

GENERAL MACHINERY CORPORATION
"The Machine Tool Merchants"
140 Federal St. Boston, Mass.

36"x15" American, motor driven Lathe
No. 1 Brown & Sharpe Plain Grinder
No. 1 Kempsmith Universal Miller
No. 1 Kearney & Trecker Plain Miller
No. 2 Kearney & Trecker Plain Miller
2½' American Radial Drill

H. A. SMITH MACHINERY CO.
501-505 East Water St. Syracuse, N. Y.

Thread Millers and Gear Cutters

2 Waltham Bench Thread Millers.
1 Waltham Automatic Pinion Cutter, No. 1.
2 Waltham Semi-Automatic Pinion Cutters, No. 1.
1 Waltham Semi-Automatic Pinion Cutters, No. 2.
2 Small Sloan & Chase Bench Pinion Cutters.
All of these are in A-1 Shape. Write for full description.

IDEAL MACHINERY CO.
Plainville, Conn.

EXCEPTIONAL VALUES
REBUILT AND GUARANTEED MACHINE TOOLS

Engine and Turret Lathes

86"x16' L. & S. Selec. Grd. Hd., Q.C. Lathe.
36"x16' Boye & Emmes Q.C. Lathe.
30"x14' Lodge & Shipley Q.C. Lathe.
27"x16' American Hi-Duty Grd. Hd. Q.C. Lathe, Taper Attach.
24"x16' L. & S. Q.C. Lathe, Taper Attach.
20"x16' Whitcomb-Blaisdell Grd. Hd., Q.C. Lathe, Taper Attach.
20"x10' American Hi-Duty Grd. Hd., Q.C. Lathe.
18"x8' LeBlond Q.C. Lathe.
16"x8' & 16"x6' Lodge & Shipley Q.C. Lathes.
16"x10' & 16"x12' Amer. Hi-Duty Grd. Hd., Q.C. Lathes.
16"x6' Hendey Grd. Hd. Q.C. Lathe.
14"x8' LeBlond Grd. Hd. Q.C. Lathe.
3"x36" Jones & Lamson Turret Lathe, Bar Equip.
3¼"x36" Acme Grd. Hd. Turret Lathe, Chuck Equip.
3¼"x40" Greenlee Flat Turret Lathe, Bar Equip.
Nos. 2, 4 & 6 Warner & Swasey Turret Lathes.
No. 4-G Millholland Grd. Hd., Turret Lathe.

Radials and Upright Drills

7' Fosdick Plain Radial, C.P.
6' N-B-Pond Semi-Universal Radial G.B.D.
5' & 4' American Triple Purpose Plain Radial, S.P.D. (Enclosed Head).
5' & 4' Cinti-Bickford Plain Radial, G.B.D.
4' Fosdick Plain Radial G.B.D.
3½' Western Plain Radial, G.B.D.
3' & 2½' Carlton B.B. Sensitive Radials.
36" & 24" Cinti-Bickford Upright Drills, G.B.D.
34", 26" & 22" W. F. & John Barnes Upright Drills.
30", 28" & 25" Snyder Upright Drills.
28", 24" & 21" Cinti-Bickford Upright Drills.
26" Barnes All Geared Drill.
25" & 21" Weigle Upright Drills.
No. 220 Baker Bros. 2 Spdle. Drill, Indexing Table.
Demco 3 Spdle. B.B. Drill, No. 2 M.T., Power Feed.
D-No. 2, D-No. 3 & D-No. 4 Colburn Hvy. Duty Drills.
No. 17 Foote-Burt 3 Spdle. Hvy. Duty Rail Drill.
No. 26-C Fox Multiple Drill & Tapper Equipped with 40 Spdles.
No. 2 Avey 4 Spdle. B.B. Drill, Power Feed.

Milling Machines

Nos. 3 B, 2 B & 2 B.S. Milwaukee Plain (Dble. Over Arm).
No. 3 Kempsmith Universal, C.P., Complete.
No. 2 Cincinnati Universal, C.P., Complete.
Nos. 2 & 1 Cleveland Universals, S.P.D., Complete.
No. 4 Cincinnati Hi-Power Vert., S.P.D., P.R.T.
No. 4 Cinti. Hi-Power Pl., arrged. for M.D., P.R.T.
Nos. 4, 3 & 2 Cinti. Hi-Power Pl., S.P.D.
No. 3 Hvy. Ohio Plain C.P., P.R.T.
Nos. 3, 2 & 1½ Cincinnati Pl., C.P.
No. 2-G LeBlond Plain, S.P.D.
Nos. 2-H & 1½ Brown & Sharpe, Plain, C.P.
Nos. 3, 4-B & 6 Becker Vertical.
No. 3 Toledo Vertical, S.P.D.
48"x42"x8' Ingersoll Slab Miller, Adjustable Rail, Horiz. Spdle.
28" Cincinnati Semi-Auto. Duplex.
No. 21 Brown & Sharpe Automatic S.P.D.
No. 15 Garvin Vertical Spdle. Milling Mch.

Gear Machinery and Grinders

Nos. 2, 3 & 12 Barber-Colman Gear Hobbers.
No. 18-H Gould & Eberhardt Hi-Duty Gear Hobber.
No. 5-A Lees-Bradner Gear Hobber.
Nos. 6 & 61 Fellows Gear Shapers.
Nos. 4 48" & 3 26" B. & S. Auto. Spur Gear Cutters.
6", 14" & 18" Gleason Bevel Gear Generators.
12" P. & W. Vert. Surf. Grinder, Rot. Mag. Chuck.
No. 2 Wilmarth & Marmon Auto. Surf. Grinder.
No. 1½ Cincinnati Univ. Tool & Cutter Grinder.
No. 70 Heald Internal Grinder (Clutch in Head).
Walker Vert Surface Grinder, 10" Dia. Mag. Chuck.
No. 29 53" Gardner Horiz. Disc Grinder, M.D.
No. 11 Brown & Sharpe Pl. Self-contained Grinder.
6"x32", 10"x50" & 10"x72" Norton Pl. Grinders.
16"x48" Landis Pl. Self-contained Crankshaft Grind.
Nos. 2, 3 & 4 Brown & Sharpe Universal Grinders.

Shapers and Planers

25" Smith & Mills Hvy. Duty B.G. Crank Shaper.
24" Walcott Hvy. Duty B.G. Crank Shaper, S.P.D.
24" Gould & Eberhardt Hi-Duty B.G. Crank Shaper, M.D. thru Gear Box.
24" Barker B.G. Crank Shaper.
20" Cincinnati Hvy. Duty B.G. Crank Shaper.
20" Milwaukee Hvy. Duty B.G. Crank Shaper.
16" G. & Eberhardt Hi-Duty B.G. Crank Shaper.
16" Smith & Mills Plain Crank Shaper.
24"x24"x10' Liberty Planer, One Head.
30"x30"x10' American Planer, One Head.
33"x33"x8' Ohio Planer, 2 Heads.
54"x54"x26' N-B-Pond Planer, 3 Heads.

Miscellaneous

3" Lambert Horiz. Boring Mill, 3" Dia. Bar.
24" Bullard Rapid Prod. Vert. Boring Mill.
30" Gisholt Vert. Boring Mill, Turret Head, P.R.T.
72" Bickford Vert. Boring Mill, 2 Heads.
Nos. 4, 5 & 6 Atlas Arbor Presses.
Nos. 2, 3-B & 4 L. N. LaPointe Broaching Mch.
Nos. 2 & 3 Pratt & Whitney Die Sinkers.
6"x14" & 6"x80" Pratt & Whitney Thread Millers.
Nos. 2, 2X & 2 B.G. Garvin Auto. Tappers.
Nos. 3-A, 3-A Hvy. Duty, & 4-A High Speed Rivetting Hammers.
No. 3 Baker Bros. Keyseater, Cap. 2½" Keyways.
96" Bliss Gap Power Sq. Shear, Cap. 1/16".
Nos. 19, 20 & 21 Bliss O.B.I. Power Presses.
P.G. No. 6 Ferracute Grd. Power Press.
S-No. 51 Ferracute Dble. Crank Power Press.
10' J.M. Robinson Power Press Brake, Cap. 10 Ga.
And Many Others. Send for Our New List.

The Eastern Machinery Co.
3261 Spring Grove Ave., Cincinnati, O.

We Also Buy Machinery
What Have You to Sell?

BORING MILLS
vertical and horizontal

Cut shows Sellers 6' Vertical Boring Mill arranged for motor drive, two swivel heads, power rapid traverse.

ONE OF A LARGE RANGE OF SIZES AND TYPES

■

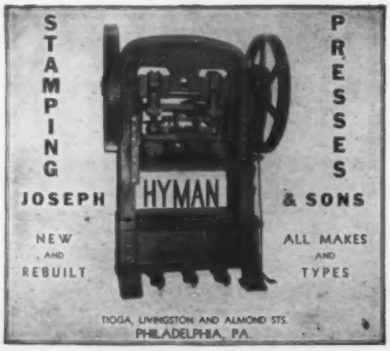
Send us your inquiry!

■

We have more than 1500 assorted machine tools in stock from a small drill press to heavy planers and boring mills. *Let us quote on your needs!*

MOREY
and Company, Inc.
410 Broome St., New York

Telephone: Canal 5360



AUTOMATIC SCREW MACHINES

8 9/16" Gridleys
Serials 3325, 3353, 3623, 3741, 3750, 3752, 3864, 3359.

11 ¾" Gridleys
Serials 4202, 5005, 5235, 5492, 6694, 7021, 7033, 7115, 7335, 7354, 7375.

3 No. 0 Brown & Sharpe
Serials 114, 292, 2393.

1 No. 56 Acme
Serial 7383.

1 1 x 5 New Britain

All in fair condition and now in operation.

Write for low close out prices

Geo. Berkson
STEWART-WARNER CORP.
1826 Diversey Parkway
Chicago, Illinois

BARGAINS—USED MACHINES

1—16x6, Marvel Chucking L. & S. Lathe.
1—16x8, 3 Step. D.B.G., L. & S. T/R Lathe.
2—18x10, Selective Mfg. L. & S. Lathes.
3—22x10, Patent Head, L. & S. Chucking Lathes.
1—27"x18' 3 Step Cone D.B.G., L. & S. Lathe.
1—36"x18' 3 Step Cone Head D.B.G., L. & S. Lathe.
1—30"x56' Heavy Duty L. & S. Forge Drilling Lathe.
1—Reversing Planer control for D.C. Motor complete with 15 H.P., 115 Volt, 225-290 R.P.M. Variable Speed Motor.
1—Buffalo Forge Co. Fan and Heater Unit.
1—Automatic Thread Chasing Machine.
1—Bement-Niles Co., Horizontal Boring Machine.
1—Heald No. 210 Ring Surface Grinder.
1—Cinti Gear Cutting Mach. Co. No. 3 Gear Cutter Grinder.
1—Brown & Sharpe No. 4—36" Automatic Gear Cutter.
1—Landis No. 2 Universal Grinder.
1—Bryant No. 10 Semi-automatic Internal Grinder.
1—Newton Vert. Slab Miller. Working Surface of Table 10"x6'. Max. Dist. from Spdle. to Table 21".
1—3 H.P., 220 V., 1500 R.P.M., D.C. Reliance motor. *Send for complete detailed descriptions.*

The Lodge & Shipley Mach. Tool Co.
Cincinnati, Ohio

UNUSUAL TOOLS

2 Spindle J. & J. Turret Lathe, all steel heads, Serials over 50,000.
6" x 14" Pratt & Whitney Thread Millers.
36" x 24" x 20" Ingersoll Double Rail Slab Miller.
36" and 42" Newton Double End Continuous horizontal type Miller.
No. 16 Blanchard Vertical Surface Grinder, M.D.
No. 168½ Toledo Toggle Drawing Press.
No. 409B Bliss Toggle Drawing Press.
36" Bullard Vertical Turret Lathes, New Era type, M.D.
LeBlond Automatic Duplex Crank Shaft Lathes.
36" x 11" Wickes Semi-automatic Crankshaft Lathes, 2 years old, like new.
50—No. 4 Warner & Swasey Turret Lathes.
2—Type E-4 Keller Die Cutters.

M. PRUSSIAN MACHINERY CO.
534 West Congress St., Detroit, Mich.

Bolt Cutters, 1½" Landis, Dble. Head (3).
Boring Mill, No. 5 Barrett, 7" spdle., belted.
Forging Machines, 3½", 3", 2½" & 1½" (steel).
Gear Cutters, G.&E., 36"x6" & 60"x12", M.D.
Header, Cold, ⅝" W-F., steel frame, M.D.
Lathe, 21"x12' LeBlond, pan, S.P.D., Gd. Hd.
Millers, 2A & 3 Becker, Vert. Rotary Table.
No. 3 Kempsmith; Nos. 3 & 4 B. & S.
Plain, No. 3 Cin., gear box in frame.
Planer, Openside, 36"x36"x10' Cleve., 3 hds.
Punch & Sh., Nos. 2 & 3 L&A., 48" tht., M.D.
"G" Cleve., 260" tht.
EF. Clev., 24" tht., Aj. M.D.
H&J., 20" tht., rapid, Aj., M.D.
Riveters, Nos. 1AA, 3A & 5½B, High Speed.
Rolls, 6"x¼" Niagara, 6" rolls, DE., belted.
Shear, Squar., 98"x1dga. Streine, Power (A-1).
Quickwork Rotary, cap. 8 ga. & 7/32".

MARR-GALBREATH MACHINERY CO.
58 Water Street. PITTSBURGH, PA.

Chicago Air Compressor 10"x12", M.D. Air Tank.
Rockford Hor. Boring, Drilling Machine.
Little Giant 350 lb. Hammer, M.D.
South Bend Lathe 16"x8', Bradford 36"x14'.
Lodge-Shipley Lathes 24"x10', 30"x16'.
Brown & Sharpe No. 4 Univ. Miller.
Taylor-Wilson Pipe Mch. 1¼" to 5".
V. & O. No. 3 and No. 1 O.B.I. Presses.
Rockford No. 3 Inc. Presses.
Massillon Punch Shear, 22" tht., arch jaw.
Cleveland Punch Shear, 48" tht., arch jaw.
Cincinnati 20" G. & E. 20" B. G. Shapers.
Doelger-Kersten Alligator Shear, 1¾", motor.
Hilles-Jones No. 3 Dbl. Angle Shear 6"x6"x1".
Traveling Cranes, Northern Engineering Hand Power, 10 ton 46'8" span, 12 ton 33'8¾" span.

RUSSELL MACHINE COMPANY
Pittsburgh, Pa.

26" Brown & Sharpe gear cutter.
¾" Lennox rotary bevel shear.
No. 14 Williams-White punch.
42" x 42" x 26' Wheeler planer.
36" Gisholt boring mill.
42" Bullard boring mill.
60" Poole boring mill 2" Bignall & Keeler pipe machine.
6" Jarecki pipe machine.
8" Williams pipe machine.
8 spindle Baush drill.
32" Cincinnati shaper.
No. 5-B Brown & Sharpe miller.
Nos. 24 & 5 Toledo Cam drawing presses.
14" x 66" Landis universal grinder.
25 and 35 K.V.A. Thompson spot welder.

Wm. C. Johnson & Sons Machy Co.
1211 North 12th St. St. Louis, Mo.

MAKE US AN OFFER
1—20" Gould Eberhardt Shaper (Excellent Condition).
1—24" Gould Eberhardt Shaper (Excellent Condition).
1—No. 3 Brown & Sharpe Univ. Miller (Excellent Condition).
6—P 3 S.B. Ferracute Presses.
1—P 2 S.B. Ferracute Press (Good Condition).

HIGHWAY TRUCK PARTS CORP.
Indianapolis, Ind. Surplus Equipment Division

Heim Centerless Grinding Machine

John W. Leahy, Danbury, Ct.

NEW LARGE DRILLS

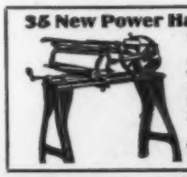
Rockford Mechanics; back geared; sliding head; geared feed.

32" $685.00
36" $815.00

WACHS-GREGG & CO.
117 to 121 North Jefferson St., Chicago, Ill.

---

36 New Power Hack Saws $35.00 ea.



Made by Millers Falls Co., their No. 89.
Capacity 4½" x 4½"
Weight 200 lbs.
Saw length 10"-12"
Strokes per min. 45
24 extra blades if cash sent with order.

J. L. LUCAS & SON, Inc.
2 Fox St., Bridgeport, Ct.

EXCEPTIONAL VALUES IN MACHINE TOOLS

30' Hetherington ver. boring mill.
10' Niles vertical boring mill, M. D.
3⅛" bar G. & Lewis horiz. bor. mch.
78 spindle Hill boiler shell drill, 28' bet. uprights.
No. 2 Baush mult. drill, rect. head.
28" Hoeffer upright drill.
No. 2 Diamond surface grinder, cap. 36"x12"x12".
No. 2 Brown & Sharpe and Reid surface grinders.
80"x40' Putnam geared head engine lathe.
48"x38' Lodge & Shipley 220 v., 3 ph., 60 cy. mo.
48"x24' H. S. & G. geared head engine lathe.
25"x12' LeBlond engine lathe, belt drive.
Nos. 2-A & 3-A Warner & Swasey Univ. tur. lathes.
American Univ. brass worker's lathes.
19"x72" P. & W. planer type milling machine; max. 32" bet. cutters, mo. dr.
No. 4 Cincinnati Univ. cone drive milling mach.
No. 2-M Potter & Johnson milling machine.
72"x72"x20' Ridgway planer, 4 heads, mo. dr.
48"x48"x16' Cleveland & D. & H. openside planers.
48"x48"x12' D. & H. openside planer, 2 hds., b. dr.
48" Bement Niles rotary planer, motor drive.
36"x36"x20' D. & H. openside planer, 2 heads.
1000 ton United Eng. hydraulic forging hammer.
300 ton United Eng. hydraulic forging hammer.
14 ton Chambersburg dbl. frame steam forg. ham.
8 ton Chambersburg dbl. frame steam forg. ham.
6000 lb. Chambersburg steam hammer.
800, 1000, 1200, and 2500 lb. bd. dp. hammers.
No. 3-A LaPointe M. T. Co.'s broaching mach.
No. 4 H. & J. plate straightening roll, 7' 2"x1" cap. mo. dr.
15-18" Dill slotter, motor drive.
No. 40-40" Maag gear cutter (new).
No. 3, 4, 5 and 6 Brown & Sharpe gear cutters.
No. 3 and 4 Newark gear cutters.
Merchants gear tooth rounder.
Electric factory trucks, all sizes and types.

MACHINE TOOLS SALES CO.
925 Commercial Trust Bldg., Phila., Pa.

LATHES

26"—48" x 14' McCabe 2 in 1, belt drive.
28" x 30' Harrington, belt drive.
20" x 20" Lodge & Shipley, belt drive, Q. C. G.
19" x 8' Sidney, belt drive, Q. C. G.
18" x 6' Rahn-Larmon, belt drive, Q. C. G.
16" x 8' American, belt drive, Q. C. G.
14" x 6' Carroll Jamieson, belt drive, Q. C. G.

O'BRIEN Machinery Company
113 N. 3rd St., Philadelphia, Pa.

RELIANCE MACHINERY SALES COMPANY
1406 Brighton Road, Pittsburgh, Pa.
No. 27 W. & W. Bulldozer, Motor Drive.
No. 4 Colburn Mfg. Type Drill, 4 Spdls.
No. 5-D Colburn Special H. D. Drill.
200 lb. Bradley Cushion Helve Hammer.
14"x6' L. & S. Grd. Hd. Lathe, SPD.
16"x8' Hendey Lathe, Tie Bar Head
30"x16' L. & S. Lathe, Q.C.G., D.B.G.
48"x19' 8" Betts H.D. Grd. Hd. Lathe.
No. 4 W. & S. Turret Lathe, G.F.H.
No. 2 Cincinnati Universal Miller, B.D.
No. 2 Ohio Plain Millers, S.P.D. (2).
No. 2 AS Milwaukee Plain Miller, S.P.D.
No. 2 Cincinnati Vertical Miller.
35"x24"x10' Newton Slab Miller, M.D.
Planers, 22", 24", 30", 33", 36" and 38".
4' Fosdick Plain Radial, S.P.D., G.B.
24" and 32" Gould & Eberhardt Shapers, M.D.
25" Smith & Mills B.G. Crank Shaper, S.P.D.
No. 3 Ryerson Hi. Sp. Friction Saw, M.D.
8' Stoll & 10' Bertsch Power Sq. Shears.

FOR SALE

DROP FORGING EQUIPMENT

Of Every Description

SPLENDID VALUES, INSPECTION INVITED

RICHMOND FORGINGS CORPORATION
RICHMOND, VA.

Rolling Mill Machinery For Sale

One United Engineering & Foundry Co. Alligator Shear, 12" knife, right hand, cap. 2" rds.
One Doelger & Kirsten 15" knife, right-hand, high knife, belt driven, Alligator Shear, cap. 2" rds.
One Plate Shear, 30" knife, 27" throat, belt driven.
One Doelger & Kirsten No. 2 low-knife, 12" knife, left-hand, belt driven Shear.
One United Engineering and Foundry Company Alligator Shear, cap. 3" rds., 36" knife, belt driven, 40 h.p.
One United Engineering and Foundry Company Guillotine Plate Shear, 42" x 1", belt driven.
One Alligator Shear, 8" knife, high-knife.
One 300-ton Hydraulic Press, Accumulator Pump.
One Doelger & Kirsten No. 4 H Alligator Shear, 26" knife, right-hand, belt driven, cap. 5" rds.
One New 20-ton Truck Scale.
One 20" Engine Lathe.
One Long & Allstatter Double End Punch and Shear, 20" throat, 1" hole through 1" metal.
One Long & Allstatter Double End Punch and Shear, 14" throat, 1" hole through 1" metal.
One United Engineering and Foundry Company No. 2 Angle and Bar Straightening Machine.
Two Roll Lathes.
One United Engineering & Foundry Co. 15" mill, single stand with one stand of pinions.
One Putnam Lathe, 24" x 10'.
One 36" Back Geared Drill Press.
One 4-stand 16" Lewis Mill—4 stands finishing—1 pinion stand—with rolls and pinions. Pinions driven in oil. Late type.
One Upright Lewis Shear No. 7669C1-10" knife.
Two United Engineering and Foundry Company 42" Sliding Frame Hot Saws.
One United Engineering and Foundry Company Alligator Shear, 3" capacity.
One No. 3 Hilles & Jones power geared punch—20" throat, cap. 5 x 5 x ½ angles.
60 Cast Iron Bending Plates 5'1" x 7'2" x 6" thick—3,050 lbs. each.
One Chambersburg 750-lb. Steam Hammer.
One Morgan 1800-lb. Steam Hammer.
One 200-lb. Chambersburg Steam Hammer.
Air Hammers.
One Stetcher Deep Hole Drill Press with chuck.
One Ingersoll-Rand NE-3 Air Compressor No. 19308—14¼ & 6⅛x12" stroke. Motor & Tank.
One Sand Blast Machine—made by the American Foundry Equipment Co.

STRUCTURAL STEEL BUILDING

342' x 40'—30' to bottom of eaves—24' to top of rails on crane runway—180' of additional crane runway. Ready for re-erection. 500 to 800' of A-frame monorail system, 16' wide. Will divide.
One 4-motor Shepard crane, cage control, 40' span. One 5-ton cap. trolley and one 3-ton hoist mounted on rear of trolley. Bridge box girders. Trackway for hoist. Both cage driven.
One electric hoist, cage control, 3-ton cap.

TWO CHAPMAN GAS PRODUCERS

NEW, never used. 11' inside diameter. Continuous Floating Agitator, Water-cooled throughout, with automatic feed. Large quantity of riveted plate gas lines.

The Rockaway Rolling Mill
Rockaway, New Jersey

PRESSES *etc.*

No. 3½B BLISS toggle drawing press.

No. 1½B BLISS toggle drawing press.

No. 1 BLISS toggle drawing press.

Two No. 46 CAMERON thread rollers.

10' ROBINSON double toggle brake for light stock.

10' corrugating roll for 26 ga. galvanized.

No. 2 MAX AMS automatic double seamer.

No. 225 BLISS gang slitting machine.

Also new and used inclinable presses in stock.

A. D. White Machinery Co.
108 N. Jefferson St., Chicago, Ill.

D. E. DONY
143 Cutler Bldg., Rochester, N. Y.
No. 16 Blanchard Grinder
Taylor & Fenn Foot Presses
No. 3 Geier Straightening Presses
No. 6E Bliss Press
No. 155 McDonald Presses
No. 165 McDonald Presses
No. 16 Bliss Horning Presses
No. 2 Bliss Power Formers

No. 508 LOY & NAWRATH Press Brake, 8' capacity 3/8".
BLISS Double Crank Geared Press, 38" between housings, weight 15,000 lb.
14 No. 3 ROBINSON Inclinable Presses, 4" stroke.
15 ton P. & H. four motor Crane with 5 ton auxiliary.
220 H.P. GENERAL ELECTRIC Synchronous Motor with exciter, 900 R.P.M., 220v., 60 cycle, 3 phase.
10" ROLLING MILL, four stands; 1 break down stand, rail splitter, roll lathe, extra rolls.

1", 1¼", 1½", 2", and 3½" Ajax Upsetters, steel bed.
1", 1½", 2", and 4" Acme Upsetters, steel bed.
Nos. 1, 2, 4, 7, and 9 Williams-White Bulldozers.
New Doty Guillotine Shear, capacity 3¼".
Bradley Hammers, all sizes, helve and upright.
Nos. 2 and 3 Pratt & Whitney Die Sinkers.
No. 30 Natco Drill.
Landis Threading Machines, all sizes.
Cold and Hot Headers; Thread Rollers; Tappers; Trimmers; Straight sided, Inclinable, and Solid Backed Presses.

DONAHUE STEEL PRODUCTS CO.

74th and Ashland Avenue
CHICAGO, ILL.

Practical specialists in selection, purchase and resale of Forging, Bolt, Nut, Rivet and Structural Machinery

---

ROLLING MILL PLANT

9" and 14" Mills, Motor Drive, Continuous Heating Furnace, Shears, Roll Lathe, Grinder, Air Compressor, Floor Plates, Motors, Coiler, etc.

HENRY POTTS & CO.
Bankers Trust Building, Philadelphia, Pa.

Three Bottom Pour Whiting Ladles

each with a slag spout. 1 Removal Square Bail. Dimensions of Ladles, height inside 65", top diameter 65", bottom diameter 54". Used only 3 months.

ATLAS STEEL CASTING CO.
1963 Elmwood Av., Buffalo, N. Y.

WELDERS

BUTT · SPOT · SEAM

We are specialists in rebuilt welding machines. Write us for our long list to select from.

TAYLOR-HALL WELDING CORP.
99 Hope Ave., Worcester, Mass.

BUTT WELDER

No. 12-X—Swift Butt Welder having transformer capacity of 25 K.V.A. @ 80% power factor.

SCULLY-JONES & COMPANY
1913 South Rockwell St., Chicago.

No. 40 WINFIELD B-103 Butt Welding Machine

220 V., single phase, 60 cycle.

Further information upon request.

Box 344, Petersburg, Virginia

500—BLOWERS—FANS—EXHAUSTERS—500
Spencer Turbine 5400'; Gen'l Elec. 2500'; Root-Connersville, Piqua, Green, Sturtevant, *Positive Pressure Rotary Blowers.* Large stock, all pressures. Fan Types—Am. Blower Co., Buffalo, Sturtevant, Garden City, Clarage, etc. Air Compressors, Receivers, Vacuum Pumps, all purposes. Tremendous Stock. High and Low Pressure. Small and Large Volumes. Send Specifications. Reliable *"Wind Jammers"* for every application. MONEY SAVING BARGAINS.
Clifton Mehry. Co., 1023 West 6th St., Cincinnati, O.

DRYER

Louisville, steam, 66" dia. 22 ft. long. 32—4½" tubes, all in prime condition, bargain.

MOTORS

1—Fairbanks-Morse 150 H.P. Type B, 60 cycle, 3 phase, 550-1100-2200 volt, 690 r.p.m.
1—General Electric, 150 H.P., Type I, 60 cycle, 3 phase, 550-1100-2200 volt, 570 r.p.m.

Mallory Machinery Corp.
Baltimore, Md.

Two New No. 6 Whiting Cupolas

66" shell dia.

OLIVER FARM EQUIPMENT COMPANY
South Bend, Indiana

FOR SALE:

Three used Diesel Engines

Complete with Generators, Switchboards and all appliances. For further information, write

W. A. Riddell Company
BUCYRUS, OHIO

AIR COMPRESSORS

ELECTRIC-MOTOR DRIVEN

1—2350 cu. ft. WORTH. fthr. valve, 3/60/2200.
1—2033 cu. ft. ING.-Rand PRE-2, 3/60/2200.
1—1584 cu. ft. CHGO. PNEU. OCE, 3/60/2200.
1—1308 cu. ft. CHGO PNEM. OCE, 3/60/220.
1—1302 cu. ft. ING.-RAND PRE-2, 3/60/220.
1—1050 cu. ft. SULLIVAN, 3/60/440.
1— 807 cu. ft. SULLIVAN, 3/60/440.
1— 627 cu. ft. CHGO. PNEU. OCE, 3/60/440.
1— 300 cu. ft. NAT'L BRAKE, 3-VS, 3/60/220/-440.

BELTED

1—1190 cu. ft. ING.-RAND XB-2, 22x13x16, Belt.
1— 888 cu. ft. ING.-RAND XB-2, 19x12x16, Belt.
1— 599 cu. ft. ING.-RAND XB-2, 16x10x14, Belt.
3— 528 cu. ft. ING.-RAND ER-1, 14x13, Belt. Complete line of smaller sizes.

STEAM

1—5715 cu. ft. ING.-RAND ORC-3, comp. steam, 2 stage air.
2—1530 cu. ft. ING.-RAND XPV-3, comp. steam, 2 stage air.
1—599 cu. ft. ING.-RAND X-2, dup. steam, 2 stage air.
1—386 cu. ft. CHGO. PNEU. NSS, 12x12x12.
1—355 cu. ft. ING.-RAND FR-1, 12x12x10.

Every unit guaranteed throughout when shipped.

A. G. Schoonmaker & Sons, Inc.
30 Church Street New York City
Shops and Warehouses—Jersey City, N. J.

AIR COMPRESSOR

1—Chicago Pneumatic Type O.C.E., 17"x10"x12" Serial over 8000; direct mounted with Synchronous motor 150 H.P., 3 ph., 220 v., 60 cycle complete with 1—4.5 K.W., D.C.—125 V. belt driven Exciter, Panel Board, Compensator, Controls—850 cu. ft.

VICTOR MACHINERY EXCHANGE
251 Centre St., New York, N. Y.

BOILER

1—400 H.P.B. & W. Boiler, A.S.M.E. Code, Penna. Standard, 200-lb. working pressure, complete with fittings and fixtures, used only 3 years.

McDERMOTT BROS. CO.
ALLENTOWN, PENNA.

BOILERS

2—333 H.P. B. & W. Steel Header Type.
1—600 H.P. B. & W. Steel Header Type.
All equipped with superheaters and stokers. 175/200 lbs. pressure.

ROTARY CONVERTER

1—150 K.W., G.E. 220 volts, 682 amps. D.C., 6 Phase, 60 Cy., 1200 R.P.M. with—
3—55 KVA. G.E. single phase, 60 Cy. OISC. out-door transformers 2200/1980 volts prim. to 165/82½ vs. secy. A.C. and D.C. Panels.

TURBO UNIT

1—1560 KVA. Westg. 3 Ph. 60 Cy. 440 Volt 3600 R.P.M. with Surface Condensing Equipment.
1—1560 KVA. Westg. 3 Ph. 60 Cy. 600 Volt 3600 R.P.M. with Condensing Equipment.
1—800 K.W. Moore-All. Chal. Mixed pressure type, 3 Ph., 60 Cy., 480 Volts, 3600 RPM., with Condensing Equipment.
MOTORS—A.C. and D.C. of all sizes.
TRANSFORMERS OF EVERY DESCRIPTION.

ARCHER & BALDWIN, INC.

126 Liberty Street, New York, N. Y.
Telephone Hitchcock 4545

BOILERS

2—500 H.P. Heine Water Tube, 160 lbs. Pressure, A.S.M.E. code.
2—180 H.P. Keeler water tube, 200 lb. Pressure, A.S.M.E. code.
1—150 H.P. 72" x 18' Hor. Ret. Tubular, 150 lb. Pressure, A.S.M.E. code.

GENERATOR SETS

2—50 KVA, 220 volt, 3 phase, 60 cycle, Ridgway Generators, direct connected to Ridgway Engines.

O'BRIEN Machinery Company

113 N. 3rd St., Philadelphia, Pa.

BARGAINS

A. C. MOTORS
3 Phase, 60 Cycle

H.P.	Make	Volts	Type	Speed
1—600	G. E.	440/220	TS-Synch.	360
1—600	G. E.	550/440	IM-Slip Ring	1200
1—500	Al.Ch.	2200/550	ANY-Slip-Ring	505
1—450	G. E.	440/220	IP-Slip Ring	720
2—300	West.	440/220	G.-Synch.	600
1—200	West.	440/220	CW-Slip Ring	580
2—200	F.Mor.	440/220	BV Slip Ring	600
1—150	G. E.	440/220	IK-Sq. Cage	1200
10—100	West.	550	CS-Sq. Cage	720
2—100	West.	220	CS-Sq. Cage	720
1— 92	G. E.	440/220	ITC-MSl. Ring	495
1— 75	G. E.	440/220	MT-Slip Ring	885
1— 75	West.	220/440	CW-Slip Ring	860

ROTARY CONVERTER

1—165 k.w. G. E. Type HCC—125-250/275 v., 6 ph., 60 cy., 1200 r.p.m. Fully complete with 3-80 K. V. A. 2070/2300-4000 V. transformers and 3 wire S/B.

Large Stock of FULLY GUARANTEED a.c. and d.c. MOTORS — GENERATORS — TRANSFORMERS and ELECTRICAL EQUIPMENT.

BELYEA COMPANY
Incorporated
147 West 18th St., New York City

A. C. Engine Generator Set

200 KW Crocker Wheeler generator direct connected to Ames Engine complete with switchboard, late type, in excellent condition. Immediate shipment. Large stock of Motors, Generators, etc.

L. J. LAND
144 Grand Street
NEW YORK, N. Y.

325 KVA AMES UNIFLOW GENERATOR

Engine 23 in. x 24 in., 200 RPM, 150 Lb. Pressure, Allis-Chalmers Generator, 40 Degrees, 230 Volts, 60 Cycle, 3 Phase, 783 Amperes.

Can be inspected in operation.

SPECIAL PRICE TO SELL IMMEDIATELY FROM PRESENT LOCATION.

Wire .... or .... Phone

A. G. SCHOONMAKER & SONS, INC.

30 Church St., New York, N. Y.

Phone: CORtland 4306.

A.C. and D.C. CRANES

50T. 50'; 30T. 72' and 25T.75' Spans A.C.

14x9x10 COMPRESSOR MOTOR DRIVE.

220 V., 60 Cy., 3 Ph., 2 stage Tandem

100-140T. 65' Span, 2 Trolleys—D.C.

4 NEW HYD. PUMPS

200 GPM-1500 lb. arranged motor drive

ROSS POWER EQUIP. CO., Indianapolis, Ind.

ELECTRIC CRANES

Of every capacity, span and current, altered to suit your requirements, immediate shipment. Send us your inquiries.

T. B. MacCABE

2230 W. Lippincott St., Phila., Pa.

LIFTING MAGNETS

C H 43" — B O & M 45"

C H 18" — C H 18" x 52"

We buy, sell and exchange lifting magnets.

GOODMAN ELECTRIC MACHINERY CO.

126 Green St., Newark, N. J.

CRANES

Factory Rebuilt with New Machine Guarantee

(All Sizes)

We have a limited number of these machines which have been completely rebuilt in our factory and carry the same guarantee as our new equipment!

The following sizes with various lengths of booms, 6, 10, 12, 15, 19 and 20 ton lifting capacities.

For clamshell bucket work to handle ½, ¾, 1, 1¼, 1½, or 2 cu. yd. buckets.

NORTHWEST ENGINEERING CO.

1817 Steger Building

Chicago, Ill.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels cranes and draglines

---

MOTORS FOR SALE

2 Ea., 2500 H.P. SYNCH. MOTORS Westgh. 3 ph., 60 cy., 2200 volt, 80% P. F., 200 r.p.m. with Shafts and Bearings. Used less than 60 days.

H.P.	*Make*	*R.P.M.*	*Volts*
700	Westgh. Syn.	200	2200
470	G. E. Syn.	514	550/3200
450	Westgh. Syn.	1200	2200
400	Westgh. "CS"	500	2200
300	G. E. Slip Ring	580	2200
250	C. W. Slip Ring	600	2200
200	G. E. Slip Ring	600	2200
200	G. E. Slip Ring	450	440
150	G. E. Slip Ring	450	440
150	C. W. Slip Ring	440	440

For Particulars Apply

JOHN D. CRAWBUCK CO.

Empire Building, Pittsburgh, Pa.

LIFTING MAGNET

One 45" E. C. & M. first class condition, price $600.00 F.O.B. Detroit.

Michigan Equipment Company

2847 Grand River Ave., Detroit, Mich.

Steel Water Tank

Hemispherical bottom, steel tower, diameter 17', total height 59', capacity 40,800 gallons, 48" steel riser pipe. Standing on foundations, empty but painted. Alicia, Pa. Further information on request.

MONESSEN COAL & COKE CO.

P. O. Box 72, Pittsburgh, Pa.

MOTOR GENERATOR

500 KW., 250 Volt, Gen. Elec. interpole generator, type MPC., direct connected to 700 HP., 3 phase, 60 cycle, 440/2300/-4000 volt, Gen. Elec. synchronous motor with A.C. and D. C. panels.

MILL MOTORS

2— 60 HP., MC4 Westgh.
1— 75 HP., MC4 Westgh.
2—100 HP., MC4 Westgh.
2—125 HP., MC5 Westgh.
2—240 HP., G.E. C02011.

George Sachsenmaier Co.

8407 Hegerman St., Holmesburg, Phila., Pa.

5" Rd. Forging Steel

We have for sale 160 tons 5" round Hot Rolled bars 10 ft. long, free from pipes and seams, hot sawed ends and commercially straight.

CARBON .08-.15 PHOS. .05 and under
MANG. .30-.60 SULP. .05 and under

This is excellent forging quality steel and will sell entire lot or carload quantity. If interested send us your inquiries.

BUDD WHEEL COMPANY

12141 Charlevoix Avenue

Detroit, Michigan

TELEPHONE BARCLAY 2133 — **N.B.PAYNE & CO.** — 25 CHURCH ST. NEW YORK

CRANES — **HOISTS**

Special lot of SHEPARD hoists and cranes. Will sell at bargain prices.

Also cranes and hoists of other makes. All sizes, A.C. and D.C.

8" GALVANIZED CORRUGATED PIPE

6000 ft. 8" NEW GALVANIZED CORRUGATED pipe in lengths 16 to 20 ft., suitable for exhaust drains, water systems, sewers, etc. Have the necessary New connecting sleeves. Priced considerably under the market.

2000 ft. 12" Naylor Black asphalted spiral welded slip joint pipe, slightly used.

MARINE METAL & SUPPLY CO.

167 South Street — **New York City**

A.C.—OVERHEAD TRAVELING CRANES—D.C.

40 Ton Northern, 4 motor, practically new, 47' 1" span, 220 volts D.C.

25 Ton Cleveland, 4 motor, brand new, cage controlled, span to suit, 220-440 volts, 3 ph., 60 cycle.

10 Ton Niles or Shaw, 3 motor, good condition, cage controlled, 50' 4" span, 220-440 volts, 3 ph., 60 cy.

5 Ton Niles Crane, 3 motor, cage controlled, span to suit, 20 volts D.C. or will sell trolley alone.

1 Ton Brown Hoist, 3 motor, 29' 0" span, cage controlled, 220 volts, D.C.

James P. Armel, 323 Fulton Bldg., Pittsburgh, Pa.

LOCOMOTIVE CRANES
For Sale or Rent

1—Type "L" INDUSTRIAL, 40 ton cap. Steel Erection Crane, 3 wheel MCB double drums, 115 ft. sectional boom, ASME boiler, outriggers. Fine condition.

1—No. 4 BROWNHOIST, 15-20 ton cap., 3 wheel MCB, double drums, 48'3½" boom, ASME boiler.

PHILIP T. KING, *"The Crane Man"*

50 Church St. — **New York**

Second Hand **PIPE** New Threads

Black & Galv. & Couplings

Special Price-2" Black

L. & D. PIPE SUPPLY CO., INC.

1100 Flushing Ave., Brooklyn, N. Y.

Write or Wire

RAILS

Many Rare Bargains in New and Used, All Sizes

SPECIAL BARGAIN THIS WEEK IS

1500 tons 60 lb. No. 1 Relaying Rails, ASCE Section, with Angle Bars.

Lowest Delivered Price.

A FEW OTHER SPECIALS

500 tons 25 lb. New but Rusty from lying in pile. Excellent Buy.
250 tons 40 lb. No. 1 Relay.
1100 tons 56 lb. No. 1 Relay.
800 tons 70 lb. No. 1 Relay.
All complete with Angle Bars.

TRACK SPIKES

Headquarters for Real Bargains
400 Kegs 5½x9/16 Seconds.
800 Kegs 5½x9/16 Firsts.
500 Kegs 6 x9/16 Seconds.
700 Kegs 5½x⅝ Seconds.
2500 Kegs 6 x⅝ Seconds.

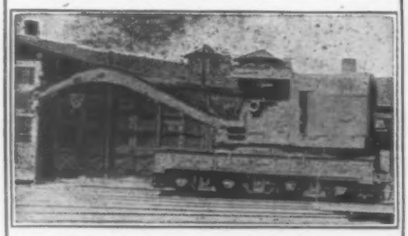
OIL ENGINES

2—66 HP. Foos Diesel, New, Never Used.
125 HP. Bessemer, Type 4, Used 4 months, Like New.
180 HP. Fairbanks Morse, VA, Cold Start, D/C to 3/60/2300 v. Generator, First Class.
2—360 HP. Fairbanks Morse, Full Diesel, with Generators.
These and many other makes and sizes at Substantial Savings.

GENERATORS

50 KVA Westinghouse 3/60/2300 V., A.C.
100 KVA Fort Wayne, 3/60/2300 V., A.C.
165 KW Westinghouse 125/250 V., D.C.

WRECKING CRANE



50-60 ton Industrial Works, ASME Boiler, Excellent, Very Low Price.

LOCOMOTIVE, ELECTRIC. 36" Ga.

1—30 ton Double Truck, 250 V.
10—12 ton Single Truck, 250 V.
2—30 ton Double Truck Combination, Storage Battery and Trolley Type.

LOCOMOTIVE, GASOLINE. 36" Ga.

2—7 ton Whitcomb, Excellent.
2—12 ton Vulcan, Excellent.

LOCOMOTIVE, STEAM. 36" Ga.

1—10x16 Davenport, S.T. Good.
Many others of various sizes and makes.

CARS. 36" Ga.

70—4 yd. Western & Koppel, 2 way Dump.
15—10 yd. Koppel, Dbl. Truck, Dump.
300—Single Truck Platform, 5'x10' Deck.
50—80,000 lb. Steel Underframe Flats.
All excellent and low prices.

STREET RAILWAY JACKS

150—No. 2 Barrett, Excellent, Big Sacrifice to Move Quick.

PIPE

Used Steel, New.

100,000 ft. 2" Used, Good.
5,000 ft. 2½" Used, Good.
50,000 ft. 3" Used, Good.
5,000 ft. 4" Used, Good.
10,000 ft. 8" Used, Good.

Cast Iron

150 tons 6" Bell and Spigot, Good.
200 tons 8" Bell and Spigot, Excellent.
900 tons 10" Bell & Spigot, Like New.
88 R. D. Wood, Mathews Pattern 4" Hydrants, Sacrifice Price.

NEW PIPE, ANY QUANTITY, ANY SIZE SPECIAL LOW PRICES

Before Buying or Selling Anything Consult

ZELNICKER IN ST. LOUIS

32 Years in Rails, R.R. and Contractors Equipment, Oil Engines, Machinery, Hoists, Tanks, Air Compressors, Boilers, Steel Sheet Piling, etc.

Have you received our 60 page Bulletin No. 400? If not ask for it.

SATISFACTION

ALBERT PIPE SUPPLY CO., INC.

NEW-RECLAIMED-USED

PIPE

ALL SIZES CUT TO SKETCH AND STOCKED

BERRY & NORTH 13th STS. BROOKLYN, N.Y.

SERVICE PRICES GUARANTEED

Second Hand Wrought Iron and Steel **PIPE** Overhauled Rethreaded Coupled

All Sizes in Stock

Greenpoint Iron & Pipe Co., Inc.

187-189 Maspeth Avenue, Brooklyn, N. Y.

PIPE NEW SECONDHAND

Overhauled and Tested
New Threads and Couplings
Established 1904

Albert & Davidson Pipe Corp.

2nd Ave., 50th-51st Sts. Brooklyn, N. Y.

PIPE NEW AND SECOND HAND

Overhauled with new threads and couplings

PIPE CUT TO SKETCH
ALSO TUBES OF ALL SIZES

ATLANTIC STEEL & PIPE CORP.

Stewart Ave. & Meadow St., Brooklyn, N. Y.
Tel. Pulaski 9200

THE PERRY BUXTON DOANE CO.

IRON—STEEL—SCRAP

DISMANTLING

OFFICES		YARDS	
Boston	Philadelphia	So. Boston	Providence
New York	Hartford	Coatesville	Worcester
		Portland	

Louis Cohen & Son

IRON—STEEL—SCRAP

RELAYING RAILS

WE DISMANTLE PLANTS

Office: Wilkes-Barre, Pa.

Yards: Wilkes-Barre, Pa. Buttonwood, Pa.

100—50 Tons Capacity

ALL STEEL HOPPER DUMP ORE CARS

In Splendid Condition
Lowest price in years

DULUTH IRON & METAL CO.

Duluth, Minn.

RAILS

NEW & RELAYING ALL WEIGHTS

Please advise weight per yard and tonnage you want. We may have same in stock right near you. We can make very low prices on New Frog and Switch Material; also second hand Locomotives.

We buy Rails fit to relay

ROBINSON & ORR

Columbia Bldg., 248 Fourth Ave., Pittsburgh, Pa.

RAILS

New
Relaying

TRACK MATERIALS
FROGS & SWITCHES

Wire or phone your inquiry at our expense

The PERRY BUXTON DOANE COMPANY

1010 Pennsylvania Bldg., Philadelphia, Pa.

RAILS

NEW-RELAY

Frogs
Switches
Tieplates
Bolts - Spikes
From Warehouse Stock

S. W. LINDHEIMER Inc.

30 S. DEARBORN ST. CHICAGO

Relaying Rails

all sections in stock, for immediate shipment, also portable track. Prices cheerfully quoted.

M. K. FRANK

220 East 42nd St. New York, N. Y.
Clark Building Pittsburgh, Pa.

RELAYING RAILS

All Sections

Continental Iron & Steel Co.

33 Rector Street New York, N. Y.

RAILS

TRACK MATERIALS RAILWAY EQUIPMENT

E. C. SHERWOOD 48 Church St. New York

Tel. Nos. Cortland 3322-3323

RAILS

ALL TRACK ACCESSORIES

NEW and RECONDITIONED

CHICAGO PITTSBURGH BUFFALO INDIANAPOLIS HARRISBURG

MORRISON RAILWAY SUPPLY CORP.

We Want To Buy

Specific "Wants" Quickly Filled

If you looked at this section for prospective purchasers, think of the many others that do the same. When you are in the market it is a sure-fire guide to the materials or equipment you want in a hurry.

USE IT

WANTED
3" or 4" Horizontal Boring and Milling Machine
In A-1 condition. State price and location.
THE TANNEWITZ WORKS
Grand Rapids, Mich.

SURPLUS STOCKS
of
Taps, Dies, Reamers, Drills and Cutters
ADDRESS BOX G-340
care *The Iron Age*, 239 W. 39th St., New York.

3 Ft. Radial Drill Press
Capacity up to 3" Dia. Hole. Variable Speed Head Motor Drive. Round Column. Must be modern and practically new. Suitable for Die Room. Advise Age, Condition, Serial, Send Illustrated Description.
LANSING DROP FORGE CO.
Lansing, Mich.

WANTED
One Used 12 Ft. Vertical Brake
of the Ohls type with capacity to bend 10 gauge sheets.
B. F. AVERY & SONS
Louisville, Kentucky

15,000 lb. and 100,000 lb. Testing Machines.
No. 56 and 57 Toledo Trimming Presses or equivalent.
Double Crank Press about 42" between housings, 200 ton capacity.
3,000 lb. Single Frame Steam Forging Hammer.
1,000 lb. Board Drop Hammers.
Donahue Steel Products Co., Inc.
74th St. & Ashland Ave., Chicago, Ill.

800 to 1200 CMF Synchronous Motor Driven Compressor
Must be first class. Advise complete specifications, age, condition, lowest Cash Price, where located for Inspection.
ADDRESS BOX G-357
care *The Iron Age*, 239 W. 39th St., New York.

Coal Crusher or Pulverizer
Capacity about 400 tons per hour. Crushing 6" to 1¼", Hammer or Ring type. Give full details, lowest cash price and where can be seen.
ADDRESS BOX G-352
care *The Iron Age*, 239 W. 39th St., New York

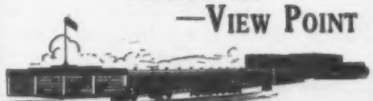
TUBING
Seamless and Welded Steel Tubing
Steel Pipe
Mail us your surplus lists.
ADDRESS BOX C-905
Care *The Iron Age*, 239 W. 39th St., New York.

Contract Work

Franklin Machine Company
Engineers—Founders—Machinists
PROVIDENCE, R. I.
WANTED:—Light and Heavy Machine Work of all kinds, also light and heavy gray iron castings up to 40,000 lbs. in one piece.

SPECIAL MACHINERY
TOOLS—MACHINE PARTS
We operate a large plant devoted exclusively to above work and have every facility necessary in equipment and engineering experience.
Correspondence solicited.
C. H. COWDREY MACHINE CO.
30 Summer St. Fitchburg, Mass.

TO YOUR DESIGN
Machinery built with the same degree of accuracy as we put into our own Product.
THE WATSON-STILLMAN CO.
71 West St., New York

SPECIAL MACHINERY
CONTRACT MANUFACTURING
—EQUIPMENT
—PERSONNEL
—VIEW POINT

THE HARTFORD SPECIAL MACHINERY CO.
TOOLS AND FIXTURES — HARTFORD, CONN. — SPECIAL MACHINERY DESIGNED AND BUILT

HIGH CLASS MACHINE WORK
We have capacity for a limited amount of additional medium weight machine work requiring accuracy. Pieces up to 5 tons.
JOHN J. CAVAGNARO
ENGINEERS Established 1898 MACHINISTS
6th ST., HARRISON, N. J. 257 CENTRE ST., N. Y. C.

MACHINE WORK
General Machine Work, Special Machinery, Turret Lathe Work, Machined Parts, Patterns, Castings and Forgings. Send Blue Prints for Estimates or ask to have representatives call.
PORTER MACHINE COMPANY, Inc.
113-115 Plymouth Street, Jersey City, N. J.
10 minutes from New York
Telephone Number Montgomery 5-0360

Designing and Building
special machinery for all kinds of production work. Well equipped machine shop for all kinds of contract work from the smallest to the largest jobs. Facilities for handling the heaviest castings.
Jones Machine Tool Wks., Inc.
5300 Lansdowne Ave., Philadelphia, Pa.

Contract Machine Work
Parts and Complete Machines. Heat Treating and Grinding. Mail Blue Prints for Quotations.
GENERAL MACHINE WORKS
York, Pa.

MACHINE PARTS
Made from Pipe; Spacers, etc. Threading, Drilling, Turning, etc. Large or small quantities.
Fabricated Steel Products Co.
Wheeling, W. Va.

MANUFACTURING MACHINISTS
Builders of Spec. Machinery
CONTRACT MACHINE WORK
Correspondence Solicited
G. F. CLINGERMAN MFG. CO.
Bellefontaine, Ohio

STAMPINGS
Light and Medium
Electric Spot Welding and
Assembled Units
We specialize in designing stampings to substitute castings. Dies designed and built for quantity production.
Eastern Tool & Stamping Co., Inc.
39 Ballard Street, Saugus, Mass.

Manufacturing for Others Since 1869
Metal Goods—Special Machinery
Production facilities for stamping, press work, machining, welding, japanning, assembling and sheet metal work.
E. Behringer Sheet Metal Wks., Inc.
108-122 Jabez St. Newark, N. J.

SHEET METAL WORK
Black and galvanized sheet metal products for every industrial use. Send blue prints for estimates on special jobs. Address Dept. V.
Steel Buildings, Skylights, Ventilators, Decking
SAINT PAUL CORRUGATING CO.
3-23 WEST WATER ST. SAINT PAUL, MINN.

COLD ROLLED PRESTEEL STRIP STEEL
DEEP DRAWING
STAMPINGS ALL METALS
DIFFICULT FORMING
WORCESTER PRESSED STEEL CO.
WORCESTER MASSACHUSETTS

Metal Stampings
HARDWARE SPECIALTIES
ASSEMBLIES
HUEBEL MFG. CO., INC.
103 MONROE ST. NEWARK, N. J.

Screw Machine Products
Diameter up to 1¾". Large battery of automatics available. Send blue prints or samples for quotations. Accurate workmanship. Good delivery.
BROWN BAG FILLING MACHINE CO.
10 Main St., Fitchburg, Mass.

WE CAN MAKE IT
Let us make your stampings, sheet metal working dies, jigs, fixtures, tools, etc.
Our work is right— our price is right.
General Machine & Manufacturing Company
544 Iranistan Ave., Bridgeport, Conn.

STAMPINGS
and
PRESS WORK—HOT or COLD
With a Service That Satisfies
DAVIS BRAKE BEAM CO.
Johnstown, Pa.

SCREW MACHINE PRODUCTS
Metal Parts and Assemblies
Good Uniform Quality
THE NEWTON Mfg. Co.
125 West Main St.
Plainville, Conn.

PRESSED METAL
Stamped and Drawn Parts
to order
"Made from Stanley Steel"
THE STANLEY WORKS
Pressed Metal Division
New Britain, Conn.
New York, Chicago, Philadelphia, Detroit
San Francisco, Los Angeles, Seattle

Dies and Metal Stampings
We can design your dies and make your stampings. Modern plant equipped with power presses ranging up to three tons.
Send your samples or blueprints for estimates.
KEYSTONE FRICTION HINGE CO.
Williamsport, Pa.

SCREW MACHINE PRODUCTS
ALL SIZES
Complete Finishing Facilities
HARTFORD MACHINE SCREW CO.
Hartford, Conn.

THE H. C. COOK CO.
For 25 years located in the center of Brass Industry—Specializing in Metal Stampings and Screw Machine parts—Expert tool makers and modern shop facilities at your service. Address
38 Beaver St., Ansonia, Conn.

STAMPINGS—DIES
Let us manufacture your
SHEET METAL SPECIALTIES
Acme Stamping & Mfg. Co.
Send us your samples or drawings for prices
Corliss & Rudd Sts., Pittsburgh, Pa.

SCREW MACHINE PRODUCTS
Small and Large Quantities
Capacity 3"
PENN SCREW & MACHINE WORKS
708-12 Cherry St., Philadelphia, Pa.

Stamping Specialties
Light stampings of any kind made from tin plate, aluminum, brass, copper sheets, etc. We design and build our own dies, tools, etc. Send blue print or samples for quotations.
Patent Specialty Supply Co., Inc.
FURNACE ST.
Est. 1897 CAMBRIDGE, N. Y. Inc. 1916

Hydraulic Press Work
Any Size or Thickness
Structural and Plate Fabricating
Job Machine Work
Inquiries Solicited
WM. WILKOFF, Inc.
NILES, OHIO

Luers Bros. Machinery & Tool Co.
1920 Rivard St., Detroit Mich.
Producers of
SCREW MACHINE PRODUCTS

Metal Stampings
Sheet Metal Specialties
Work in all Metals 14 Gage, or Lighter
Electric Welding; Enameling and Japanning.
Metal Spinning. Deep Drawing
LUNA METAL CRAFT CORP.
38-40 EMERSON PL., BROOKLYN, N. Y.

Punch Press—Screw Machine Parts
Gear Cutting
Hardened and Ground Material
Heat Treating
BURGESS-NORTON MFG. CO.
553 Peyton Street, Geneva, Ill.

SHEET METAL WORK
Send prints for estimates on all kinds of sheet metal work; riveted or welded construction up to ⅜" plate; also metal spinning.
KELKER BLOWER CO., INC.
19 Bush St. Buffalo, N. Y.

Stampings
Facilities above the average.
Write us for quotations.
Great Lakes Pressed Steel Corp.
1410 Niagara St. Buffalo, N. Y.

HYDRAULIC PRESSINGS
Heavy and Light
Inquiries Solicited
for the Manufacture of
Structural and Steel
Plate Patented Specialties
PENNSYLVANIA CAR COMPANY
Kansas City, Kansas

METAL STAMPING
Designing and Manufacturing
TOOLS—DIES
SPECIAL MACHINERY
Penn Jersey Metal Products Corp.
Newton Ave. and Line St., Camden, N. J.

RATES
for ads in the Classified Section

RATE PER INSERTION

SPACE	NUMBER OF INSERTIONS					
	1	2	4	8	26	52
1"	$5.75	$5.25	$4.75	$4.38	$4.13	$4.00
2"	10.50	9.50	8.75	8.25	8.00	7.75
3"	15.75	14.25	13.13	12.38	12.00	11.63
4"	19.00	17.50	16.50	16.00	15.50	15.00
5"	23.75	21.88	20.63	20.00	19.38	18.75
6"	28.50	26.25	24.75	24.00	23.25	22.50
8"	35.00	33.00	32.00	32.00	30.00	29.00
⅓ page 12"	46.67	44.00	42.67	42.67	40.00	38.67
½ page	52.50	49.50	48.00	46.50	45.00	42.00
1 page	66.00	64.00	64.00	62.00	58.00	54.00
	128.00	128.00	124.00	120.00	108.00	100.00

SCREW MACHINE PRODUCTS
of
ALLOY AND
COLD ROLLED STEEL
Up to 2¼" Dia.

★

EXCELLENT DELIVERY

★

We Are Expert Heat Treaters

★

STANDARD
PRESSED STEEL COMPANY
Box 523
Jenkintown, Pa.

CASTINGS

Intelligently Made in Gray Iron, Semi-Steel, Brass & Aluminum

We specialize on duplicate parts—accurate, cheap, delivered on time. Also pattern making or machining if you require. Modern shop and modern methods make prices right and enable us to guarantee satisfaction. Send blueprints.

YORK FOUNDRY AND
YORK MACHINE CO. PENN.

GREY IRON CASTINGS and METAL STAMPINGS

Up to date porcelain enameling, nickel plating & japanning departments, also machining. Let us quote. Truck deliveries Phila. & Metropolitan New York.

TOPTON FOUNDRY COMPANY
Topton, Pa.

BRASS—BRONZE & ALUMINUM CASTINGS
AS CAST OR MACHINED COMPLETE
Metal Assemblies of all Kinds.
The ATLAS BRASS FOUNDRY CO
COLUMBUS, OHIO

Let Us Make Your
GREY IRON CASTINGS
and Do Your
MACHINE WORK
on Contract
WE KNOW HOW
Would Appreciate Opportunity of Quoting
ROYERSFORD FOUNDRY & MCH. CO.
ROYERSFORD, PA., U. S. A.

Gray Iron—Semi-Steel—Cast Steel
HEAVY CASTINGS
"Mixtures for all purposes"
We do Special Machine Work up to large jobs and work to close limits when necessary.
HARDIE-TYNES MANUFACTURING CO.
Birmingham Alabama

WOOD *and* METAL
PATTERNS
Aluminum Matchplates
Send Blueprints for Estimates
BASCOM & CO., Troy, N. Y.
Established 93 Years

DIE CASTINGS STAMPINGS

CHROME AND NICKEL PLATING
Enameling, Color Spraying, Machining, Assembling
HIGH QUALITY—LOW COSTS
Welker-Hoops Mfg. Co., Middletown, Conn.

Our Specialties—Grey Iron Castings
Superior quality, machine or hand moulded, sand blasted, pickled or tumbled. On good tonnage we will make special moulding equipment that will warrant you the best price and most efficient service. Patterns made of wood, brass, aluminum or iron. Grinding wheel machinery, hack saw machines. Huntington emery wheel dressers and cutters, drill press vises, wire rod cutters.
NORTH WALES MACHINE CO., INC.
Phone 147 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania.

DROP FORGINGS

We are in a position at this time to name some mighty attractive prices and delivery. Any size from any steel.
Allowing us an opportunity to quote will not be regretted.

W. P. PAUL CO., PHILA., PA.

ON QUANTITY PRODUCTION
LIGHT GREY IRON CASTINGS
WE GUARANTEE
QUALITY, SERVICE
LOW PRICES
THE CONNECTICUT FOUNDRY CO.
Rocky Hill, Ct.

Gray Iron and Semi-Steel Castings

Charcoal "Mayari" and low phos. mixtures. Quality castings for machinery, blank gears, dies, piston rings, etc.
Up to 1½ tons.

Penn Foundry & Mfg. Co.
Reading, Pa.

GALVANIZING

By the Hot Dip Process

Angles, tees, channels, rounds and all bar shapes. Garbage and ash cans, steel barrels, castings (malleable, steel and gray iron). Carload shipments to our own siding via Erie R. R.

Transmission tower and pole line hardware a specialty.

NEWARK GALVANIZING CO.
29 Verona Avenue, Newark, N. J.

NICKEL and CHROMIUM ALLOYS
of
GREY IRON
Machinability—Wear—High Strength
Heat Resisting
The TURNER & SEYMOUR MFG. CO.
Torrington, Conn.

Grey Iron Castings
of all descriptions
our own pattern
and machine shop.
EYSTER, WEISER CO.
Established 1832
YORK, PA.

IRON AND STEEL WORKS

in Middle Western Canada open to manufacture in Canada for American concerns.
Have well equipped steel, iron and brass foundry, pattern, machine, blacksmith, boiler, tank, structural and ornamental iron shops.
Highest Banking and Mercantile references. If interested
ADDRESS BOX E-675
care *The Iron Age*, 239 W. 39th St., New York.

BRASS AND BRONZE CASTINGS
1 lb. to 2000 lbs.
Capacity 16,000 lbs. per day
OUR SPECIALTIES
WORM AND GEAR BRONZE, BRIDGE BRONZE, ACID PROOF BRONZE, BRONZTOX BUSHINGS AND BARS.
A. W. CADMAN MFG. CO. Pittsburgh, Pa.
Established 1860

HOT DIP GALVANIZING

We have the largest hot dip galvanizing plant and kettles in the United States. We have the most modern equipment to do first class galvanizing at lowest prices.
Prime Western Zinc used exclusively. Galvanized products furnished.
Send Us Your Inquiries

Joseph P. Cattie & Brothers
Gaul and Letterly Streets
Philadelphia

Buffalo Bronze Die Cast Corp.
100 Arthur St., Buffalo, N. Y.
SPECIALISTS IN
Aluminum Bronze Die Castings
Chilled Tin Bronze Castings
Brass and Aluminum Castings

SMALL AND MEDIUM
GRAY IRON CASTINGS
HOT TINNING—JAPANNING
COLEBROOKDALE IRON CO.
Dept. S Pottstown, Pa.
ESTABLISHED 1835

CATTIE BROTHERS CORPORATION
Philadelphia Galvanizing and Tinning Works
Galvanized Angles, Cut to Length and Punched, Carried in Stock:
Galvanized Bars, Channels, Ovals, Half Ovals, Bolts, Spikes and Other Materials.
Tioga, Sepviva and Witte Sts., Philadelphia, Pa.

Gray Iron and Semi-Steel Castings
5 to 6,000 pounds
Machine Work, Structural Steel
GIFFORD-WOOD CO.
Hudson, N. Y. 1885

Small Grey Iron Castings
(SOFT)
For quantity production; *easily machined.* Nickel chromium or manganese alloys if desired. Estimate?
KLINE HARDWARE CO.
Allentown, Pa.

Business Opportunities

FOR SALE

Factory Building, 55'x150' located on approximately one acre of ground. Has concrete floor, is well lighted and can have P.R.R. connection. Equipped with heating plant. Location Southern Pennsylvania.

ADDRESS BOX B-434
care *The Iron Age*, 239 W. 39th St., New York.

STRUCTURAL STEEL SHOP

400 tons capacity, wonderful money maker, for sale. About $30,000 required to handle this proposition. Good opportunity for parties experienced in Structural Steel fabricating business.

ADDRESS BOX G-319
care *The Iron Age*, 239 W. 39th St., New York.

European Company having strong basic patents throughout the world covering system of tubular scaffolding, utilizing universal single piece fittings, seamless steel tubes, which system has proved unqualified success in Europe are prepared to negotiate for American and Canadian rights with strong financial and manufacturing group. This is a first class proposition giving virtual control and monopoly of enormous business. No agents or intermediary parties considered. **Address Box G-359, Care The Iron Age**, 239 W. 39th St., New York.

CANADIAN REPRESENTATION

A large and responsible American manufacturer with established Canadian branch and selling organization which contacts industrials, creameries, process industries, chemical plants, and paper mills, can offer profitable sales connection for equipment usable in these industries.

ADDRESS BOX G-343
care *The Iron Age*, 239 W. 39th St., New York

Manufacturers' Agent

Well established, covering New York City and adjoining territory, wants additional high grade accounts. Commission basis.

ADDRESS BOX E-371
care *The Iron Age*, 239 W. 39th St., New York.

—ATTENTION—

American Manufacturers

Do You Contemplate Establishing A Canadian Branch Plant?

Why not give us an opportunity to manufacture for you, until your requirements warrant a separate Plant investment?

We have excess manufacturing capacity.

HAMILTON, Ontario, where we are located, enjoys exceptional distributive facilities.

We produce all kinds of ALUMINUM, ZINC, and WHITE METAL DIE CASTINGS by DOEHLER PROCESS,—also all kinds of BRASS, BRONZE and ALUMINUM FOUNDRY CASTINGS.

LIGHT STAMPINGS — LIGHT MACHINE WORK and SPINNINGS

Also, COPPER, ZINC, CADMIUM, NICKEL and CHROMIUM PLATING WORK.

Please address—
General Manager,
BOX G-274
Care *The Iron Age*, 239 W. 39th St., New York

Manufacturers' Representative

Sales Engineer experienced in selling heavy machinery, boilers, tanks and special steel plate work, desirous of forming connection with responsible manufacturer for the exclusive sale of these products in New York City. Domestic and Export.

ADDRESS BOX G-331
care *The Iron Age*, 239 W. 39th St., New York.

Sales Representatives

wanted by Michigan corporation engaged in manufacturing of light and heavy stampings from all metals, specializing in deep drawn work. In reply state territory now being covered and give full information regarding ability to serve us.

ADDRESS BOX G-333
care *The Iron Age*, 239 W. 39th St., New York

— DEFENDABLE —

APPRAISALS

(Qualified Experts in all lines)

Standard Appraisal Company
New York, Chicago, Boston, Atlanta

PATENTS

Expert on metal products and metallurgical patents. Examiner U. S. Patent Office for 16 years.

JOHN BOYLE, Jr.—Patents
201 Ouray Building Washington, D. C.

CONTRACT 236

SEALED BIDS will be received by the Board of Water Supply, at its offices, eleventh floor, 346 Broadway, New York City, until 10 A. M., Eastern Standard time, on Tuesday, July 15, 1930, for Contract 236, for furnishing and delivering ten 48 by 36 by 36-inch, one 48 by 36-inch and twenty-two 72 by 48 by 48-inch shaft caps and appurtenances for City Tunnel No. 2, all as set forth in the specifications. At the above place and time the bids will be publicly opened and read. Pamphlets containing information for bidders, forms of bid and contract, specifications, contract drawings, etc., can be obtained at the office of the Secretary at the above address, by depositing the sum of five dollars ($5) in cash or its equivalent for each pamphlet. For further particulars apply to the office of the Chief Engineer at the above address. GEORGE J GILLESPIE, President, PHILIP F. DONOHUE, WM. F. DELANEY, Commissioners, Board of Water Supply; BENJ. F. EINBIGLER, Secty.

Profit by using
THE CLASSIFIED SECTIONS
of The Iron Age

Employment Exchange

HELP WANTED

PRODUCTION OR METHODS ENGINEER

Wanted by well known and long established manufacturing concern in Toronto, Canada.

Must have had actual technical experience in foundry, metal stamping and drawing, and porcelain enamel work besides experience in methods, motion study, time study and introduction of wage incentives.

Salary $3600.00.

In application give full particulars in regard to experience, education, age and nationality.

Address Box No. G-353
Care *The Iron Age*, 239 W. 39th St.
New York.

ENGINEER, 30 to 40 years of age; technically trained; experienced in rolling mill work, design or operation, or both; desired for development work, application of anti-friction bearings to rolling mill equipment; must have good personality and ability to understand commercial problem; no sales work involved. Position requires experienced technical man and not a salesman. Address Box G-258, care *The Iron Age*, 239 W. 39th St., New York.

CAN SHOW LETTERS from men who have given up their lines held for 20 years for our product. Sold to factories, hardware and mill supply houses. 40% commission in full upon receipt of order. Established firm, wonderful money maker, product, and repeater. Entire time or side line. Address Box G-242, care *The Iron Age*, 239 W. 39th St., New York.

HELP WANTED

DESIGNING ENGINEER—Opportunity for a thoroughly experienced, trained designer on standard and mill type overhead cranes. The right man will have charge of and be responsible for all engineering work. This position requires a man of long experience in this special class of work. Cleveland district. Strictly confidential. Address Box C-974, care *The Iron Age*, 1362 Hanna Bldg., Cleveland, Ohio.

SALES REPRESENTATIVES who can produce to complete our sales organization in Exclusive Open Territories; commission only. Syrosil is an established refractory lining for Industrial and Steam Boiler Furnaces used by Studebaker and other large firms. It is infusible at 3400 deg. F., resists slag and iron oxide. Syrosil Company, Elkhart, Ind.

SALESMAN—New York, Brooklyn, Long Island—established trade and product. Entire time—permanent; for industrials and jobbers—large earnings—paid in full weekly. This is an exceptional opportunity for right man who means business. Replies confidential—personal interview. Address Box G-309, are *The Iron Age*, 239 W. 39th St., New York.

FIRST CLASS MACHINE TOOL DESIGNER preferably with experience on boring mills. Splendid opportunity for good man. State age, experience and salary. Address Box G-322, care *The Iron Age*, 239 W. 39th St., New York.

SALESMAN—Good opportunity for a man familiar with pickling practice to sell inhibitors to the steel mills. Some knowledge of chemistry is desirable. Give details of past experience, connections and qualifications for the position. All of our employees have been advised of this ad. Address Box G-348, care *The Iron Age*, 239 W. 39th St., New York.

HELP WANTED

WANTED—FOUNDRY SUPERINTENDENT by Company manufacturing gray iron light weight castings. Experience must include up-to-date cupola practice, mechanical molding, conveying systems, and sand control, with knowledge of pattern and foundry molding equipment. Give qualifications, experience, state whether employed and salary expected. Address Box G-363, care *The Iron Age*, 239 W. 39th St., New York.

WE WANT A SALESMAN to sell small and medium sized electric steel and alloy castings in the Cleveland district on a straight commission basis. Foundry located to give prompt delivery in this section. Address Box G-350, care *The Iron Age*, 239 W. 39th St., New York.

EMPLOYMENT SERVICE

SALARIED POSITIONS
$2,500 to $25,000

If you are qualified for position between $2,500 and $25,000, and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established twenty years ago, to conduct confidential preliminaries and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. R. W. Bixby, Inc., 274 Main St., Buffalo, N. Y.

Employment Exchange

EMPLOYMENT SERVICE

When $5,000.00 to $50,000.00 men in the metal working industries can be better served in making new connections than they have been served for eleven (11) years by us, this organization will be selected for the task. INDIVIDUAL, CONFIDENTIAL. Leading business men in the metal trades know us and believe in us. Not an employment agency. **JACOB PENN, Inc., 11 Park Place, New York City.**

POSITIONS OPEN

For Foundry and Manufacturing Executives, Engineers, Draftsmen, Chemists and Metallurgists, Sales Executives and Sales Engineers. Write for application—No advance charges.

H. H. HARRISON, Inc.
A Superior Personnel Service
20 W. Jackson Blvd. Chicago, Ill.

POSITIONS in all branches of the Iron, Steel and Allied Industries may be obtained through our efficient Employment Service. *Personnel Extension Bureau*, 917 Equitable Bldg., Baltimore, Md.

SITUATIONS WANTED

MANUFACTURING EXECUTIVE—Practical mechanical engineer, with thorough knowledge of design, foundry, machine and tool practice, the buying of all kinds of materials with the best system of efficiency, planning, routing and cost with a thorough understanding of labor, of handling a large number of men—a man of keen executive and organizing ability, capable of throwing immediate speed and accuracy into production to make things pay. Available on short notice. Address Box G-330, care *The Iron Age*, 239 W. 39th St., New York.

MY JOB HAS BEEN the analysis and working out of organization, manufacturing, production, equipment, and cost problems of machine shop, forge, and foundry, on diversified products. Nine years, superintendent large plant; previously, plant engineer, shop foreman, equipment designer, draftsman. Member American Society Mechanical Engineers. Age forty; Married. Connection that will afford opportunity for progressive future desired. Address Box G-305, care *The Iron Age*, 239 W. 39th St., New York.

SUPERINTENDENT OR GENERAL FOREMAN—Practical and technical training with 20 years all around manufacturing experience along the line of modern machine shop, production, and assemblies including tools, fixtures, and dies. Executive qualifications necessary to supervise men with record of results. Available immediately. Any location in the U. S. A. Address Box G-287, care *The Iron Age*, 239 W. 39th St., New York.

STEEL METALLURGIST and ENGINEER, 25 years' experience Open Hearth, Bessemer, Electric, Crucible. Forging, Mill, Heat-treatment, Research. Open for Plant engagement or Consultant. Address Box G-342, care *The Iron Age*, 239 W. 39th St., New York.

SITUATIONS WANTED

METALLURGIST - CHEMIST - FOUNDRYMAN; 15 years' experience; employed. Specialty cupola, gray iron, plain, alloy, high test. Expert sand control and mixtures, investigation, casting complaints, elimination shrinkage and porosity troubles, selection and use of materials to best advantage. Good general knowledge, molding practice, cost finding and control. Increase business by adjusting quality to meet special need of customer. Executive ability. Age 40. Address Box G-339, care *The Iron Age*, 239 W. 39th St., New York.

SALESMAN or BRANCH OFFICE MANAGER—Steel Products. Young man with 24 years' experience in buying and selling metals, ferro-alloys and steel products; now assistant manager of domestic and export sales organization handling these products. Desires connection with jobber or manufacturer in this line. Best of references. East preferred. Address Box G-341, care *The Iron Age*, 239 W. 39th St., New York.

MECHANICAL ENGINEER GRADUATE and MASTER ELECTRICIAN, 10 years' experience. Technical advisor to President, Chief Engineer, Manufacturing Production, Oil Refining, Pipe Bending, Machine Welding, Arc Welding, Modern Design, now employed. Married, age 31. Starting salary $5,000.00 per year. Address Box G-335, care *The Iron Age*, 239 W. 39th St., New York.

ENGINEER EXPERIENCED ON STEEL mill work. Has had complete charge of design and installation of Blast Furnaces, Open Hearth Furnaces, Rolling Mills and Wire Mills. Now employed but desires to make a change either to steel works organization or to concern manufacturing steel and wire mill machinery. Address Box G-347, care *The Iron Age*, 239 W. 39th St., New York.

STEEL SALESMAN—Twenty years' experience in selling high quality Tool Steels and Alloy Steels. Engineering education with machine shop experience and general business training. Open for engagement August 1st. Will go anywhere in the United States for suitable opening. Highest references as to character and ability. Address Box G-346, care *The Iron Age*, 239 W. 39th St., New York.

ASSISTANT TO THE PRESIDENT OR GENERAL SALES MANAGER—39, Broad technical, shop and engineering experience. Eight years as Director of sales and machine tool salesman for concern of national scope. Central West preferred. Address Box G-240, care *The Iron Age*, 239 W. 39th St., New York.

GREY IRON FOUNDRY EXECUTIVE—Manager, General Superintendent or Sales Manager. For detailed information as to experience, etc., Address Box G-304, care *The Iron Age*, 239 W. 39th St., New York.

GENERAL MANAGER, 38, available. Successful record sales, production and general administration with over fifteen hundred employees. Reputation for increasing profits. Address Box 189-D, care *The Iron Age*, 1507 Otis Bldg., Chicago.

SUPERINTENDENT, WORKS or FACTORY MANAGER, wide and varied experience in the mechanical and manufacturing field. Practical and technical training with record of results. Address Box G-329, care *The Iron Age*, 239 W. 39th St., New York.

GREY IRON FOUNDRY, FOREMAN, twenty years' experience on general jobbing and production work. Thirty-nine years old. Moderate salary considered. McLain graduate. Address Box G-300, care *The Iron Age*, 239 W. 39th St., New York.

SITUATIONS WANTED

YOUNG MAN, 25, married, TECHNICALLY TRAINED, at present instructor of advanced drawing and shop practice in a Corporation apprentice school, desires change to Sales or Service in Philadelphia or Baltimore districts. Four years drafting and teaching experience with knowledge of modern shop methods and practice. Owns car. Confident of sales ability. Address Box G-362, care *The Iron Age*, 239 W. 39th St., New York.

FOUNDRY MANAGER — Thirty-five years' practical experience in all phases of foundry work—twenty-five years as executive and organizer. With one company twenty years. Have reorganized two unsuccessful foundries and put them on a paying basis. Looking for connection preferably with medium sized foundry. Feel confident of showing profitable results. Address Box G-351, care *The Iron Age*, 239 W. 39th St., New York.

ADVERTISING and PUBLICITY MAN with technical education and background of six years in engineering and operating, public utility field, and six years in advertising. He can write clearly and concisely and has the ability to create salient selling ideas. He seeks a connection as advertising manager or assistant. Address Box G-360, care *The Iron Age*, 239 W. 39th St., New York.

EXPORT BUSINESS: SALES EXECUTIVE, British. With many years experience selling American Machine Tools and Supplies in England and the United States is prepared to return and open office in London to directly represent group of American manufacturers on cooperative basis. Address Box G-358, care *The Iron Age*, 239 W. 39th St., New York.

SALES REPRESENTATIVE—LARGE AND VALUABLE ACQUAINTANCE WITH FOUNDRIES, STOVE MANUFACTURERS, COAL MINES AND SUPPLY HOUSES IN SOUTH, DESIRES CONNECTION, SALARY OR COMMISSION BASIS. HIGHEST CREDENTIALS. ADDRESS BOX G-354, CARE *THE IRON AGE*, 239 W. 39th ST., NEW YORK.

EXECUTIVE in charge of engineering, production and sales with prominent manufacturing concern, desires new connections; high grade mechanical-industrial engineer with years of practical experience in engineering and management of industrial plants. Address Box G-355, care *The Iron Age*, 239 W. 39th St., New York.

DETROIT MANUFACTURERS' SALES AGENT, with established clientele among automobile and industrial plants in Michigan, desires to represent manufacturer of a high grade product, preferably on a commission basis. Address Box G-356, care *The Iron Age*, 239 W. 39th St., New York.

FOUNDRY SUPERINTENDENT. Twenty years experience in the manufacturing and treating of alloy and manganese steel products, also street and steam track work. Able to take complete charge and get results. Best of references if desired. Address Box G-361, care *The Iron Age*, 239 W. 39th St., New York.

ELECTRIC STEEL MELTER, desires to change position. Maker of plain and alloyed steels, including non-corrosive grades, acid and basic, 12 years' experience. Wants to work as foreman or melter with possibility to advance. Address Box G-349, care *The Iron Age*, 239 W. 39th St., New York.

METALLOGRAPHIST — Experienced in the metallography of iron, steel and non-ferrous metals, able to read Fe-C equilibrium diagram. Address Box G-321, care *The Iron Age*, 239 W. 39th St., New York.

Help Wanted Rates

Set solid, minimum 50 words.....$3.00
Each additional word 6c

All capitals, minimum 50 words.....$4.50
Each additional word 9c

All capitals, leaded, minimum 50 words...$6.00
Each additional word 12c

Situations Wanted Rates

Set solid, minimum 25 words.....$ .75
Each additional word 3c

All capitals, minimum 25 words.....$1.50
Each additional word 6c

All capitals, leaded, minimum 25 words....$2.25
Each additional word 9c

Display Advertising Rates Given on Request

COUNT SEVEN WORDS FOR KEYED ADDRESS

Do not send original letters of recommendation in replying to advertisements—duplicates will answer the purpose. Letters forwarded without charge.

Products Index

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVES
Pangborn Corp., Hagerstown, Md.

ACCOUNTANTS
Stone, Francis & Hart, 165 Broadway, N. Y. C.

ACCUMULATORS—Hydraulic
Elmes, Chas. F., Engrg. Works, Chicago.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Lake Erie Engng. Corp., Buffalo, N. Y.
Southwark Fdry. & Mach. Co., Phila.
Watson-Stillman Co., 71 West St., N.Y.C.
Wood, R. D., & Co., Philadelphia.

ACETYLENE—Dissolved in Cylinders
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
International Oxygen Co., Newark, N. J.
Prest-O-Lite Co., Inc., The, 30 E. 42nd St., New York City.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.

AIR TANKS AND CYLINDERS
Air-Tight Steel Tank Co., Ptgh.
Janney, Joseph A., Jr., Phila.
Scaife, William B., & Sons Co., Ptgh.

ALLOYS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

ALLOYS—Tungsten
Vanadium Corp. of America, 120 B'way, N. Y. C.

ALLOYS—Vanadium
Vanadium Corp. of America, 120 B'way, N. Y. C.

ALUMINUM
Rogers Brown & Crocker Bros., Inc., 21 East 40th St., N. Y. C.

ANGLES, BEAMS, CHANNELS AND TEES
Bethlehem (Pa.) Steel Company
Carnegie Steel Co., Pittsburgh
Illinois Steel Co., Chicago, Ill.
Phoenix Iron Co., Phila.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.

ANNEALING—See Heat Treating

ANODES
Meaker Co., The, Chicago.

ANVILS
Atkins, E. C., & Co., Indianapolis, Ind.
Eagle Anvil Works, Trenton, N. J.
West Steel Casting Co., The, Cleveland.

APPRAISERS
Standard Appraisal Co., 6 Church St., N. Y. C.

ARMORING MACHINES—Wire, Cable, Hose, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

ARMORING SURFACE—For Concrete
Irving Iron Wks. Co., L. I. City, N. Y.

ARRESTERS—Spark
Harrington & King Perforating Co., Chi.

AXLES—Car or Locomotive
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.

BABBITT METAL
Ryerson, Jos. T., & Son, Inc., Chicago.

BAFFLE WALLS
Johns-Manville Corp., 292 Madison Ave., New York City.

BALING PRESSES—Hydraulic
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.

BALING PRESSES—Scrap Metal
Galland-Henning Mfg. Co., Milwaukee.

BALLS—Burnishing
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.

BALLS—Forged Chrome Steel for Pulverizing
Philadelphia (Pa.) Steel & Iron Co.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.
Auburn Ball Bearing Co., Rochester, N. Y.
New Departure Mfg. Co., Bristol, Ct.

BANDS—Steel
Akron-Selle Co., Akron, Ohio.
Bethlehem (Pa.) Steel Company
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Sharon (Pa.) Steel Hoop Co.

BANDS—Welded
Amer. Welding & Mfg. Co., Warren, O.

BARRELS—Burnishing
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Mach. & Stpg. Co., Cleveland

BARRELS—Plating
Meaker Co., The, Chicago.

BARRELS—Steel Shop
Cleveland (O.) Wire Spring Co.

BARRELS—Tumbling—See Tumbling Barrels

BARS—Alloy
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.

BARS—Cast Bronze
Buckeye Brass & Mfg. Co., Cleveland.

BARS—Concrete, Reinforcing
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Phila.
Ryerson, Jos. T., & Son, Inc., Chicago.

BARS—Manganese Steel
Manganese Steel Forge Co., Phila.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

BARS—Steel
Ames, W. & Co., Jersey City, N. J.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Carnegie Steel Co., Pittsburgh.
Illinois Steel Co., Chicago, Ill.
Kinite Corp., The, Milwaukee.
Philadelphia (Pa.) Steel & Iron Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago
Timken Roller Bearing Co., Canton, Ohio.
Youngstown (O.) Sheet & Tube Co.

BASKETS—Pickling
Breese Bros. Co., Cincinnati.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees.

BEARING METAL
Fredericksen Co., Saginaw, Mich.
Stewart Die-Casting Corp., Chicago.

BEARINGS—Ball
Auburn Ball Bearing Co., Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
New Departure Mfg. Co., Bristol, Ct.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Standard Machinery Co., Auburn, R. I.

BEARINGS—Brass and Bronze
Buckeye Brass & Mfg. Co., Cleveland.
Buffalo (N. Y.) Bronze Die Cast Corp.
Erie (Pa.) Bronze Co.
Fredericksen Co., Saginaw, Mich.
Lumen Bearing Co., Buffalo, N. Y.
Stewart Die-Casting Corp., Chicago.

BEARINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Radial
Bantam Ball Bearing Co., South Bend, Ind.

BEARINGS—Roller
Bantam Ball Bearing Co., South Bend, Ind.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Standard Machinery Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.

BEARINGS—Roller, Tapered
Timken Roller Bearing Co., Canton, O.

BEARINGS—Thrust
Bantam Ball Bearing Co., South Bend, Ind.
Standard Mchry. Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, Ohio.

BELT DRESSING
Graton & Knight Co., Worcester, Mass.

BELT FASTENERS
Smith, F. P., & Co., Sharon Hills, Pa.

BELT LACING
Graton & Knight Co., Worcester, Mass.

BELTING—Cement
Graton & Knight Co., Worcester, Mass.

BELTING—Chain
Cross Engineering Co., Carbondale, Pa.

BELTING—Conveyor
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

BELTING—Leather
Graton & Knight Co., Worcester, Mass.

BELTING—Leather Link
Graton & Knight Co., Worcester, Mass.

BELTING—Rubber
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

BENCHES AND TABLES—Steel
Standard Pressed Steel Co., Jenkintown, Pa.

BENCHES — Draw—See Wire Drawing Machinery

BENDING MACHINES—Angle or I-Beams
Buffalo (N. Y.) Forge Co., 492 B'way.
Galland-Henning Mfg. Co., Milwaukee.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Ptgh.

BENDING MACHINES, BAR—Circle or Spiral
Kardong Bros., Inc., Minneapolis, Minn.

BENDING MACHINES—Hand and Power
American Pipe Bending Mch. Co., Boston.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Kane & Roach, Syracuse, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Yoder Co., The, Cleveland, O.

BILLET GOUGERS & PEELERS
Manning, Maxwell & Moore, Inc., 100 E. 42nd Street, N. Y. C.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.

BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon Vanadium Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Nickel Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Die Block Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Forging
Andrews Steel Co., Newport, Ky.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Heppenstall Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Ryerson, Jos. T., & Son, Inc., Chicago

BILLETS—Nickel Steel
Andrews Steel Co., The, Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.

BILLETS—Re-rolling
Andrews Steel Co., Newport, Ky.

BILLETS—Steel
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

BLANKS—Brass and Copper
Bridgeport (Conn.) Brass Co.

BLANKS—Gear & Pinion
Bethlehem (Pa.) Steel Co.
Edgewater Steel Co., Pittsburgh.

BLAST FURNACE SPECIALTIES
Brosius, Edgar E., Inc., Sharpsburg P. O., Ptgh.
Research Corp., 405 Lexington Ave., N. Y. C.

BLOCKS—Creosoted
Jennison-Wright Co., Toledo.

BLOWERS—Pressure
Anthony Co., Long Island City, N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Champion Blower & Forge Co., Lancaster Pa.

BLOWERS—Rotary
Stacey Engineering Co., The, Connersville, Ind.

BLOWPIPES—Brazing, Cutting and Welding
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

BOILER HEADS—Flanged and Dished
Bethlehem (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N.Y.C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOLT CUTTERS
Acme Mchry. Co., Cleveland, O.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
Acme Machinery Co., Cleve.
Economy Engng. Co., The, Willoughby, O.
Landis Machine Co., Inc., Waynesboro, Pa.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage & Machine.
Buffalo Bolt Co., N. Tonawanda, N. Y.
Lamson & Sessions Co., The, Cleveland, O.
Milton (Pa.) Mfg. Co.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester N. Y.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Special
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Track
Pittsburgh (Pa.) Screw & Bolt Corp.

BOLTS AND NUTS
Ames, W., & Co., Jersey City, N. J.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Bethlehem (Pa.) Steel Co.
Buffalo Bolt Co., N. Tonawanda, N. Y.
Clark Bros. Bolt Co., Milldale, Conn.
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Milton (Pa.) Mfg. Co.
Neely Nut & Bolt Co., Ptgh.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Reed & Prince Mfg. Co., Worcester, Mass.
Rhode Island Tool Co., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.

BORING, DRILLING AND MILLING MACHINES—Horizontal
Barnes, W. F., & John Co., Rockford, Ill.
Defiance (O.) Mch. Wks.
Hill, Clarke & Co. of Chicago, 647 W Washington Blvd., Chicago, Ill.
Lucas Machine Tool Co., Cleve.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sellers, William, & Co., Inc., Phila.
Universal Boring Mch. Co., Hudson, Mass.

BORING & DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo.
Bullard Co., The, Bridgeport, Ct.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.

BORING BARS
Bullard Co., The, Bridgeport, Ct.

BORING MACHINES—Cylinder
Baker Bros., Inc., Toledo.

BORING MACHINES—Jig
Pratt & Whitney Co., Hartford, Conn.

BORING AND TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Planer Co., The.
Sellers, William, & Co., Inc., Phila.

BOXES—Annealing
Blaw-Knox Co., Pittsburgh.
Petroleum Iron Wks. Co., Sharon, Pa.
Union Steel Casting Co., Pittsburgh.

(ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231)

BOXES—Steel
Cleveland (O.) Wire Spring Co.
Sterling Wheelbarrow Co., Milwaukee.

BRAKES—Electric
Clark Controller Co., The, Cleveland, O.
Cutler-Hammer, Inc., Milwaukee.

BRAKES—Metal Forming
Cincinnati (O.) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Minster (O.) Machine Co.
Ohl, Geo. A., & Co., Inc., Newark, N. J.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BRICK—Chrome
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Phila.
Stowe-Fuller Refractories Co., The, Cleve.

BRICK—Fire Clay
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.
North American Refractories Co., Cleveland, Ohio.
Stowe-Fuller Refractories Co., The, Cleve.
Taylor, Chas., Sons Co., Cincinnati, O.

BRICK—Magnesite
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Phila.

BRICK—Silica
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Phila., Pa.
U. S. Refractories Corp., Mt. Union, Pa.

BRIDGE BUILDERS
McClintic-Marshall Co., Pgh.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.
Virginia Bridge & Iron Co., Roanoke, Va.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Phila.

BROACHES
Amer. Broach & Mch. Co., Ann Arbor, Mich.
Lapointe Mch. Tool Co., Hudson, Mass.

BROACHING MACHINES
Amer. Broach & Mch. Co., Ann Arbor, Mich.
Lapointe Mch. Tool Co., Hudson, Mass.

BRONZE BAR—Cored & Solid
Fredericksen Co., Saginaw, Mich.

BRONZE—Phosphor
Phosphor Bronze Smelting Co., Phila.

BUCKETS—Clamshell
Blaw-Knox Co., Pittsburgh.
Broulus, Edgar E., Inc., Sharpsburg P. O., Pgh.
Erie (Pa.) Steel Construction Co., The.
Hayward Co., 50 Church St., N. Y. C.
Orton Crane & Shovel Co., Chicago.
Owen Bucket Co., Cleveland.

BUCKETS—Dragline
Harnischfeger Corp., Milwaukee.
Northwest Engng. Co., Chicago.

BUCKETS—Electric Motor
Hayward Co., 50 Church St., N. Y. C.

BUCKETS—Elevator
Hendrick Mfg. Co., Carbondale, Pa.

BUCKETS—Orange Peel
Hayward Co., 50 Church St., N. Y. C.

BUCKETS—Single Line
Milwaukee (Wis.) Elec. Crane & Hoist Corp.

BUCKLES—Bale, Tie
Joliet (Ill.) Wrought Washer Co.

BUFFS
Divine Brothers Co., Utica, N. Y.

BUILDINGS—Factory
Austin Co., The, Cleveland
Blaw-Knox Co., Pittsburgh.

BUILDINGS—Steel
Austin Co., The, Cleveland.
Belmont Iron Works, Phila.
Blaw-Knox Co., Pittsburgh.
Erie (Pa.) Steel Construction Co., The.
McClintic-Marshall Co., Pgh.

BULLDOZERS
Beatty Mch. & Mfg. Co., Hammond, Ind.

BUNDLERS—Scrap (Wire)
Vaughn Mchry. Co., Cuyahoga Falls, O.

BURNERS—Oil or Gas
Anthony Co., The L. I. City, N. Y.
Best, W. N., Corp., 295 5th Ave., N. Y. C.
Hauck Mfg. Co., 128 Tenth St., Bklyn., N. Y.

BURRS—Steel
Master Products Co., The, 6420 Park Ave. S. E., Cleveland.
Wrought Washer Mfg. Co., Milwaukee.

BUSHINGS—Brass and Bronze
Buckeye Brass & Mfg. Co., Cleveland.
Erie (Pa.) Bronze Co.
Fredericksen Co., Saginaw, Mich.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

CABLEWAYS AND TRAMWAYS—See Tramways

CABINETS—Steel
Angle Steel Stool Co., Plainwell, Mich.

CARBIDE
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Union Carbide Sales Co., 30 E. 42nd St., New York City.

CARBURIZING—See Heat Treating

CARS—Dump
Atlas Car & Mfg. Co., Cleveland
Easton (Pa.) Car & Construction Co.

CARS—Industrial and Mining
Atlas Car & Mfg. Co., Cleve.
Chase Fdry. & Mfg. Co., Columbus, O.
Easton (Pa.) Car & Construction Co.

CASE HARDENING—See Heat Treating

CASE HARDENING BATHS
American Cyanamid Co., 535 Fifth Ave., New York City.

CASTERS—Industrial Truck
Colson Co., The, Elyria, Ohio.

CASTINGS—Acid or Heat Resisting
American Manganese Steel Co., Chicago Heights, Ill.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.
Hoskins Mfg. Co., Detroit.
National Alloy Steel Co., Blawnox, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Alloy Steel
Bethlehem (Pa.) Steel Co.
National Alloy Steel Co., Blawnox, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
West Steel Casting Co., The, Cleveland.

CASTINGS—Aluminum
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.

CASTINGS—Brass, Bronze, Copper or Aluminum
Atlas Brass Fdry. Co., Columbus, Ohio.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Bronze Die Cast Corp.
Cadman, A. W., Mfg. Co., Pgh.
Douglas & Lomason Co., Detroit.
Erie (Pa.) Bronze Co.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Phosphor Bronze Smelting Co., Phila.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Turner & Seymour Mfg. Co., Torrington, Ct.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—Die
Buffalo (N. Y.) Bronze Die Cast Corp
Stewart Die-Casting Corp., Chicago.
United States Fare Recording Co., Inc., 511 W. 54th St., New York City.

CASTINGS—Electric Steel
American Steel Foundries, Chicago.
Calumet Electric Casteel Co., Hammond, Ind.
Commercial Steel Casting Co., Marion, O.
Crucible Steel Casting Co., Cleve.
Industrial Steel Casting Co., The, Toledo.
Maynard Elec. Steel Casting Co., Milw.
Smith, Geo. H., Steel Casting Co., Milw.
Treadwell Engineering Co., Easton, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Gray Iron
Bethlehem (Pa.) Steel Co.
Connecticut Fdry. Co., The, Rocky Hill, Ct.
Colebrookdale Iron Co., Pottstown, Pa.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Eyster, Welser Co., York, Pa.
Gifford-Wood Co., Hudson, N. Y.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Hyde Park (Pa.) Fdry. & Mach. Co.
Kline Hardware Co., Allentown, Pa.
Midvale Co., The, Nicetown, Phila., Pa.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
National Roll & Fdry. Co., Avonmore, Pa.
Newark (N. J.) Malleable Iron Wks.,
North Wales (Pa.) Mach. Co., Inc.
Penn Foundry & Mfg. Co., Box 183, Reading, Pa.
Poole Engng. & Mch. Co., Balto., Md.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Sessions Foundry Co., The, Bristol, Ct.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Toledo (O.) Mch. & Tool Co.
Topton (Pa.) Fdry. Co.
Xenia (Ohio) Fdry. & Mch. Co.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—Malleable
Flagg, Stanley G., & Co., Inc., Phila.
Malleable Iron Fittings Co., Branford, Ct.
Meeker Foundry Co., Newark, N. J.
Newark (N. J.) Malleable Iron Wks.,
Northern Mal. Iron Co., St. Paul, Minn.
Peoria (Ill.) Malleable Castings Co.
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Richmond (Ind.) Malleable Castings Co.
Timken Roller Bearing Co., Canton, Ohio.
Vermilion Mal. Iron Co., Hoopeston, Ill.

CASTINGS—Manganese Steel
American Manganese Steel Co., Chicago Hghts., Ill.
Frog, Switch & Mfg. Co., The, Carlisle, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CASTINGS—Semi-Steel
Malleable Iron Fittings Co., Branford, Ct.

CASTINGS—Steel
American Steel Foundries, Chicago.
Atlas Steel Casting Co., Buffalo, N. Y.
Bethlehem (Pa.) Steel Company
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Calumet Electric Casteel Co., Hammond, Ind.
Cann & Saul Steel Co., Phila.
Cincinnati (O.) Steel Castings Co.
Commercial Steel Casting Co., Marion, O.
Crucible Steel Casting Co., Cleveland.
Crucible Steel Castings Co., Lansdowne, Pa.
Duquesne Steel Fdry. Co., Pittsburgh, Pa.
Erie (Pa.) Forge Co.
Falk Corp., Milwaukee.
Industrial Steel Casting Co., The, Toledo.
Malleable Iron Fittings Co., Branford, Ct.
Maynard Elec. Steel Castings Co., Milw.
Smith, Geo. H., Steel Casting Co., Milw.
Strong Steel Foundry Co., Buffalo, N. Y.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Union Steel Casting Co., Pittsburgh.
Union Switch & Signal Co., Swissvale, Pa.
West Steel Casting Co., The, Cleveland.

CEMENT—Leather Belting
Graton & Knight Co., Worcester, Mass.

CEMENT—Refractory
Harbison-Walker Refractories Co., Pgh.
Johns-Manville Corp., 292 Madison Ave., New York City.

CEMENT—Silica and Chrome
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.

CEMENT ROOFING TILE
American Cement Tile Mfg. Co., 803 Oliver Bldg., Pgh.

CENTERING MACHINES
Whiton, D. E., Mach. Co., New London, Ct

CENTERS—Index
Simmons Mch. Tool Corp., Albany, N. Y.

CENTERS—Lathe and Grinder
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

CHAINS—Crane & Hoist
Bradlee & Co., Inc., Philadelphia.

CHAINS—Dredge
Bradlee & Co., Inc., Philadelphia.

CHAINS—Power Transmission
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Whitney Mfg. Co., Hartford, Conn.

CHAINS—Sling
Bradlee & Co., Inc., Phila.

CHAIRS—Adjustable
Vilek Mfg. Co., Omaha, Neb.

CHANNELS—See Angles, Beams, Channels and Tees

CHAPLETS
Erdle Perforating Co., Rochester, N. Y.

CHARGING MACHINES—Cupola
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CHARGING MACHINES—Manipulators
Alliance (Ohio) Mch. Co.

CHECKS—Metal
Noble & Westbrook Mfg. Co., Hartford, Conn.

CHEMICALS—Industrial
Vanadium Corp. of America, 120 B'way, N. Y. C.

CHUCKING MACHINES—Automatic
Baird Mch. Co., Bridgeport, Ct.

CHUCKING MACHINES—Multiple Spindle
Baird Mch. Co., Bridgeport, Ct.
National Acme Co., Cleveland.

CHUCKS—Air Operated
Logansport (Ind.) Mch. Co.

CHUCKS—Drill
Cleveland (O.) Twist Drill Co.

CHUCKS—Lathe
Hoggson & Pettis Mfg. Co., New Haven, Ct.
Whiton, D. E., Mch. Co., New London, Ct.

CIRCLES—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

CLAMPS—Drop Forged
Williams, J. H., & Co., Buffalo, N. Y.

CLAY GUNS
Brosius, Edgar E., Inc., Sharpsburg P. O., Pittsburgh

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Bruce Products Corp., Detroit.
Meaker Co., The, Chicago.
Oakite Prod., Inc., 33 Thames St., N.Y.C.

CLUTCHES—Friction
Caldwell, W. E., Co., 260 Brandeis Street, Louisville, Ky.
Johns-Manville Corp., 292 Madison Ave., New York City.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Machinery Dealers, Inc., New Haven, Ct.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., Milwaukee.

COAL
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

COAL, ORE AND ASH HANDLING MACHINERY
Alliance (O.) Machine Co.
Bartlett, C. O. & Snow Co., Cleve.
Hayward Co., The, 50 Church St., N.Y.C.

COILING MACHINES—Metallic, Hose, Speedometer, Casing, Resistance Coils, Wire Spirals, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

COILS—Pipe
Harrisburg (Pa.) Pipe & Pipe Bending Co.

COKE—Metallurgical
Cleveland (O.) Cliffs Iron Co.
Hillman Coal & Coke Co., Pgh.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.
Walter-Wallingford & Co., Cincinnati, O.

COKE OVEN MACHINERY
Alliance (O.) Machine Co.
Atlas Car & Mfg. Co., Cleve.

COLLARS—Spacing for Milling Cutters
Detroit (Mich.) Stamping Co.

COLLETS
Rivett Lathe & Grinder Corp., Boston

COMPRESSORS—Air
Allis-Chalmers Mfg. Co., Milwaukee.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co., 11 B'way, N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Machinery Co., Chicago.
Westinghouse Traction Brake Co., Wilmerding, Pa.

COMPRESSORS—Gas
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.

CONCRETE CONSTRUCTION
Austin Co., The, Cleveland.

CONCRETE MACHINERY
Ransohoff, N., Inc., Cinn., Ohio.

CONCRETE REINFORCEMENT
American Steel & Wire Co., Chicago.

CONCRETE ROOFING TILE
American Cement Tile Mfg. Co., 803 Oliver Bldg., Pgh.

CONDENSERS—Surface and Jet
Ingersoll-Rand Co., 11 B'way, N. Y. C.

CONDUCTOR PIPE
Newport (Ky.) Rolling Mill Co.

CONTRACTORS—General
Austin Co., The, Cleveland.

CONTRACTORS' SUPPLIES — Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry & N. 13th St., Bklyn., N. Y.

CONTROLLERS—Crane
Cutler-Hammer, Inc., Milwaukee.

CONTROLLERS—Electric
Cutler-Hammer, Inc., Milwaukee.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

CONTROLLERS—Electric Motor
Clark Controller Co., The, Cleveland, O.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., Cleve.

CONTROLLERS—Temperature
Bristol Co., Waterbury, Ct.
Wilson-Maeulen Co., Inc., 738 E. 143rd St., N. Y. C.

CONTROLLERS—Valve, Electrically Operated
Cutler-Hammer, Inc., Milwaukee.

CONVEYING AND ELEVATING MACHINERY
Bartlett, C. O. & Snow Co., Cleve.
Palmer-Bee Co., Detroit.
Portable Machinery Co., Clifton, N. J.

CONVEYORS—Portable
Portable Machinery Co., Clifton, N. J.

COPING MACHINES
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORUNDUM WHEELS—See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Smith, F. P., & Co., Sharon Hills, Pa.

COUNTERBORES
Cleveland (O.) Twist Drill Co.

COUNTERS—Production
Hart, R. E., Mfg. Co., Battle Creek, Mich.
United States Fare Recording Co., Inc., 511 W. 54th St., New York City.
Veeder-Root, Inc., Hartford, Ct.

COUNTERSHAFT—Cone, Variable Speed
Evans Friction Cone Co., Newton Highlands, Mass.

COUNTING MACHINES
Hart, R. E., Mfg. Co., Battle Creek, Mich.
United States Fare Recording Co., Inc., 511 W. 54th St., New York City.
Veeder-Root, Inc., Hartford, Ct.

COUPLINGS—Air Hose
Cleveland (O.) Pneumatic Tool Co., The.

COUPLINGS—Flexible
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Clark Controller Co., The, Cleveland, O.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Palmer-Bee Co., Detroit.
Poole Engng. & Mch. Co., Balto., Md.

COUPLINGS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

COUPLINGS—Pipe
Harrisburg (Pa.) Pipe & Pipe Bending Co.

COUPLINGS—Shaft
Falk Corp., Milwaukee.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Tomkins-Johnson Co., Jackson, Mich.

CRANES—Crawling Tractor
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 So. Jefferson St., Mendota, Ill.
Harnischfeger Corp., Milwaukee.
Northwest Engng. Co., Chicago.
Orton Crane & Shovel Co., Chicago.

CRANES—Electric, Industrial Truck Mounted
Crescent Truck Co., Lebanon, Pa.

CRANES—Electric Traveling
Alliance (O.) Machine Co.
American Crane Co., Inc., The, Friendship, N. Y.
Bedford (Ind.) Foundry & Machine Co.
Box Crane & Hoist Corp., Phila.
Cleveland Crane & Engng. Co., Wickliffe, O.
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 So. Jefferson St., Mendota, Ill.
Erie (Pa.) Steel Construction Co., The.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York City.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Morgan Engineering Co., Alliance, O.
Payne, N. B., & Co., 25 Church St., N.Y.C.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Roeper Crane & Hoist Wks., Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Gantry
American Crane Co., Inc., The, Friendship, N. Y.
Cleveland Crane & Engng. Co., Wickliffe, O.
Manning, Maxwell & Moore, Inc., 100 E. 42nd Street, N. Y. C.
Morgan Engineering Co., Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Hand Power
Armington Engineering Co., Euclid, O.
Bedford (Ind.) Foundry & Machine Co.
Box Crane & Hoist Corp., Phila.
Cleveland Crane & Engng. Co., Wickliffe, O.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Payne, N. B., & Co., 25 Church St., N.Y.C.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.

CRANES—Jib
Box Crane & Hoist Corp., Phila.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Locomotive
Harnischfeger Corp., Milwaukee.
King, Philip T., 50 Church St., N. Y. C.
Northwest Engng. Co., Chicago.
Ohio Locomotive Crane Co., Bucyrus, O.
Orton Crane & Shovel Co., Chicago.

CRANES—Monorail
American MonoRail Co., The, Cleveland.
Cleveland Electric Tramrail, Wickliffe, O.
Northern Engineering Works, 212 Chene Street, Detroit.
Reading (Pa.) Chain & Block Corp.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Canton (O.) Fdry. & Machine Co.

CRANES—Portable, Electric
Automatic Transportation Co., Inc., Buffalo, N. Y.

CRANES—Transfer
Reading (Pa.) Chain & Block Corp.

CRANES—Wall
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANK SHAFTS
Union Switch & Signal Co., Swissvale, Pa.

CRIMPING MACHINES
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.

CRUCIBLES—Metallurgical
McCullough-Dalzell Crucible Co., Pgh.
Ross-Tacony Crucible Co., Phila.

CRUSHERS—Coal
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleve.

CRUSHERS—Steel Turning
American Crusher & Machinery Corp 853 B'dway, N. Y. C.
American Pulverizer Co., St. Louis, Mo.

CRUSHERS—Stone
Morgan Engineering Co., Alliance, O.

CULVERTS
Newport (Ky.) Rolling Mill Co.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Prov., R. I.
Cleveland (O.) Twist Drill Co.
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTING COMPOUNDS
Oakite Prod., Inc., 22 Thames St., N.Y.C.

CUTTING OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.
Huribut Rogers Mchry. Co., The, Nashua, N. H.

CUTTING-OFF MACHINES — Pipe or Tubing
Bardons & Oliver, Cleve.
Bignall & Keeler Mach. Work, Edwardsville, Ill.
Etna Machine Co., The, Toledo, O.
Huribut Rogers Mchry. Co., The, Nashua, N. H.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene

CYANIDES
American Cyanamid Co., 535 Fifth Ave., New York City.

CYLINDERS—Compressed Air, Gas, Etc.
National Tube Co., Pittsburgh.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CYLINDERS—Seamless
Harrisburg (Pa.) Pipe & Pipe Bending Co.
National Tube Co., Pittsburgh.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DERRICKS
American-Terry-Derrick Co., South Kearney, N. J.
Hayward Co., The, 50 Church St., N. Y. C.
Mallory Machry. Corp., Baltimore.

DESKS—Steel (Factory)
Angle Steel Stool Co., Plainwell, Mich.

DIAMOND TOOLS
Dickinson, Thos. L., 34 Gold St., N. Y. C.

DIE BLOCKS
Bethlehem (Pa.) Steel Co.
Heppenstall Co., Pittsburgh.
Wetmereil Bros. Co., Cambridge, 39, Mass.

DIE SINKING MACHINES—Automatic
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

DIES—Embossing and Stamping
Hoggson & Pettis Mfg. Co., New Haven, Ct.
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.
Schwerdtle Stamp Co., Bridgeport, Ct.

DIES—Gripping and Heading
Marchant, Geo. F., Co., Chicago.

DIES—Pipe Threading
Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Ct.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.

DIES—Screw and Thread Cutting
Curtis & Curtis Co., Bridgeport, Ct.
Eastern Mach. Screw Corp., New Haven, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

DIES—Sheet Metal Working
Adriance Machine Wks., Inc., 82 Richards St., Bkyn., N. Y.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Budd-Ranney Eng. Co., The, Columbus, O.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
Kinite Corp., The, Milwaukee.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
Richards, I. P., Co., Providence, R. I.
Toledo (O.) Mach. & Tool Co.
Worcester (Mass.) Stamped Metal Co.
Zeh & Hahnemann Co., Newark, N. J.

DIES—Steel Letters and Stamps
Noble & Westbrook Mfg. Co., Hartford, Ct.

DISCS—Abrasive
Gardner Machine Co., Beloit, Wis.

DOLOMITE
Baker, J. E., Co., York, Pa.

DOORS AND SHUTTERS—Fireproof
Kinnear Manufacturing Co., 817-67 Field Ave., Columbus, Ohio.

DOORS AND SHUTTERS—Steel or Wood Rolling
Kinnear Manufacturing Co., 817-67 Field Ave., Columbus, Ohio.

DRAWBENCHES
Aetna-Standard Eng. Co., Youngstown, O.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRAWING COMPOUND
Bruce Products Corp., Detroit.

DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, O.

DRILLING MACHINES—Automatic
Barnes Drill Co., Inc., Rockford, Ill.

DRILLING MACHINES—Bench
Avey Drilling Mch. Co., Cincinnati, O.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Heavy Duty
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.

DRILLING MACHINES—Horizontal
Baker Bros., Inc., Toledo, O.
Barnes, W. F. & John, Co., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Providence, R. I.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.
Buffalo (N. Y.) Forge Co., 492 B'way.
Defiance (O.) Machine Works
Langelier Mfg. Co., Providence, R. I.
Thomas Spacing Mch. Co., Pgh., Pa.

DRILLING MACHINES—Multiple, Spindle Adjustable
Pratt & Whitney Co., Hartford, Conn.

DRILLING MACHINES—Multiple Spindle Vertical
Avey Drilling Mch. Co., Cincinnati, O.

DRILLING MACHINES—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Independent Pneumatic Tool Co., Chicago.
Standard Electrical Tool Co., The, Cinci.

DRILLING MACHINES—Portable Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneumatic Tool Co., Chicago.

DRILLING MACHINES—Radial
American Tool Works Co., Cinci.
Cincinnati (O.) Bickford Tool Co.
Cleveland (O.) Punch & Shear Wks. Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Thomas Spacing Mch. Co., Pgh., Pa.

DRILLING MACHINES—Rock
Ingersoll-Rand Co., 11 B'way, N. Y. C

DRILLING MACHINES—Sensitive
Avey Drilling Mch. Co., Cincinnati, O.
Buffalo (N. Y.) Forge Co., 492 B'way.
Langelier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Taylor & Fenn Co., Hartford, Ct.

DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.
Buffalo (N. Y.) Forge Co., 492 B'way
Champion Blower & Forge Co., Lancaster, Pa.
Cincinnati (O.) Bickford Tool Co.
Defiance (O.) Machine Works
Ryerson, Jos. T., & Son, Inc., Chicago.

DROP FORGINGS—See Forgings—Drop, Iron or Steel

DROP HAMMERS—See Hammers—Drop

DROP PRESSES—See Presses—Drop

DRYERS FOR ALL MATERIAL
Bartlett, C. O. & Snow Co., Cleve.
Buffalo (N. Y.) Forge Co., 492 B'way.
Drying Systems, Inc., Chicago, Ill.
Duff Patents Co., Inc., Pgh.

DUST COLLECTORS
Buffalo (N. Y.) Forge Co., 492 B'way.
Pangborn Corporation, Hagerstown, Md.
Research Corp., 405 Lexington Ave., N. Y. C.
Sly, W. W., Mfg. Co., Cleveland, O.

EAVE TROUGH—See Gutters

ELECTRIC WELDING—See Welding—Electric

ELECTRICAL MACHINERY — Second Hand
Land, L. J., 207 Centre St., N. Y. C.
Sachsenmaier, Geo., Co., Phila., Pa.

ELECTRICAL WIRES
American Steel & Wire Co., Chicago.

ELEVATORS—Portable
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

ELEVATORS—Steam Hydraulic
Ridgway, Craig & Son Co., Coatesville, Pa.

EMERY WHEELS—See Grinding Wheels

ENAMELING MCHS.—Magnetic Wire
Sleeper & Hartley, Inc., Worcester, Mass.

ENGINEERS—Consulting
Brassert, H. A., & Co., Chicago.
McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

ENGINEERS—Foundry
Austin Co., The, Cleveland.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

ENGINEERS—Industrial
Llewelyn, Thomas J., & Co., Pitgh.
Stone, Francis & Hart, 165 Broadway, N. Y. C.

ENGINEERS AND CONTRACTORS
Austin Co., The, Cleveland.
Criswell, James, Co., Pittsburgh, Pa.
Kennedy, Julian, Pitgh.
Laughlin, Alex., & Co., Pitgh.
McKee, Arthur G., & Co., Cleve.
Naismith, Geo., & Son, Pitgh.
Pennsylvania Engng. Wks., New Castle, Pa.
Stevens, Arthur L., Corp., Chicago.
Swindell-Dressler Corp., Box 1753, Pitgh.

ENGINES—Gas
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

ENGINES—Oil
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

ENGINES—Steam
Dake Engine Co., Grand Haven, Mich.
Troy (Pa.) Engine & Mch. Co.

EYELET MACHINES
Manville, E. J., Mch. Co., Waterbury, Ct.

EYELETS
Platt Bros. & Co., The, Waterbury, Ct.

FACING HEADS
Mummert-Dixon Co., Hanover, Pa.

FACING MACHINES—Structural
Thomas Spacing Mch. Co., Pitgh., Pa.

FACTORY CONSTRUCTION
Austin Co., The, Cleveland.

FANS—Man Cooling
Buffalo (N. Y.) Forge Co., 492 B'way.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Pipe & Pipe Bending Co.

FELTS—Wool Mechanical
Booth Felt Co., Inc., The, 477-478 19th St., Bkyn., N. Y.
Continental Felt Co., 890 B'way, N. Y. C.
Felters Co., The, Boston, Mass.

FENCES—Woven Wire
American Steel & Wire Co., Chicago.
Page Steel & Wire Co., Bridgeport, Ct.

FENCING—Wire
Bethlehem (Pa.) Steel Co.

FERRO ALLOYS—Chromium
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Samuel, Frank, & Co., Phila.
Vanadium Corp. of America, 120 B'way, N. Y. C.

FERRO ALLOYS—Manganese
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.
Samuel, Frank, & Co., Phila.

FERRO ALLOYS—Molybdenum
Lavino, E. J., & Co., Phila.

FERRO ALLOYS—Silico Manganese
Vanadium Corp. of America, 120 B'way, N. Y. C.

FERRO ALLOYS—Silicon
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.
Samuel, Frank, & Co., Phila.
Vanadium Corp. of America, 120 B'way, N. Y. C.

FERRO ALLOYS—Spiegeleisen
Rogers Brown & Crocker Bros., Inc., 31 E. 40th St., N. Y. C.

FERRO ALLOYS—Tungsten
Lavino, E. J., & Co., Phila.
Vanadium Corp. of America, 120 B'way, N. Y. C.

FERRO ALLOYS—Vanadium
Lavino, E. J., & Co., Phila.
Vanadium Corp. of America, 120 B'way, N. Y. C.

FILES AND RASPS
Atkins, E. C., & Co., Indianapolis, Ind.
Disston, Henry & Sons, Inc., Philadelphia.
Heller Bros. Co., Newark, N. J.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 292 Madison Ave., New York City.

FILTERS—Pressure or Gravity
Scaife, Wm. B., & Sons Co., Pitgh.

FIRE CLAY
General Refractories Co., Phila.
North American Refractories Co., Cleveland, Ohio.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit.

FITTINGS—Hydraulic
Watson-Stillman Co., 71 West St., N. Y. C.

FITTINGS—Tank
Flagg, Stanley G., & Co., Inc., Phila.

FLANGES—Forged Steel
Cann & Saul Steel Co., Phila.
Edgewater Steel Co., Pittsburgh.
Taylor Forge & Pipe Wks., Chicago.

FLANGES—Iron or Steel
Philadelphia (Pa.) Steel & Iron Co.

FLASKS—Foundry
Sterling Wheelbarrow Co., Milwaukee.

FLEXIBLE SHAFT EQUIPMENT
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

FLOOR ARMORING
Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.

FLOOR PLATES—See Plates—Floor or Cellar Door

FLOORING—Creosoted Wood
Jennison-Wright Co., Toledo

FLOORING—Metallic Ventilating
Irving Iron Wks. Co., L. I. City, N. Y.

FLOORING—Monolithic
Johns-Manville Corp., 292 Madison Ave., New York City.

FLOORING—Steel
Blaw-Knox Co., Pittsburgh.

FLUORSPAR
Lavino, E. J., & Co., Phila.
Rogers Brown & Crocker Bros., Inc., 31 E. 40th St., N. Y. C.

FLUX—Steel
Refined Steel Products Co., Pittsburgh.

FORGES—Rivet
Buffalo (N. Y.) Forge Co., 492 B'way
Champion Blower & Forge Co., Lancaster, Pa.
Hauck Mfg. Co., 128 Tenth St., Bkyn., N. Y.

FORGING MACHINES
Acme Machinery Co., Cleveland.
National Machinery Co., Tiffin, O.

FORGINGS—Alloy Steel
Bethlehem (Pa.) Steel Co.
Cann & Saul Steel Co., Phila.
Erie (Pa.) Forge Co.
Heppenstall Co., Pittsburgh.
Machinery Forging Co., The, Cleveland, O.
National Forge & Ordnance Co., Irvine, Pa.
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Brass, Bronze or Copper
Bossert Corp., The, Utica, N. Y.
Commonwealth Brass Corp., Detroit.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Co.
Cann & Saul Steel Co., Phila.
Canton (O.) Forge & Axle Co.
Clapp, E. D., Mfg. Co., The, 88 S. Division St., Auburn, N. Y.
Cleveland (O.) Hardware Co.
Drop Forging Co. of New York, Jersey City, N. J.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Henry Forge & Tool, Inc., Auburn, N. Y.
Indianapolis (Ind.) Drop Forging Co.
Keystone Forging Co., Northumberland, Pa.
Laclede Steel Co., St. Louis, Mo.
Milwaukee (Wis.) Forge & Mch. Co.
Paul, W. P., Co., Phila.
Philadelphia (Pa.) Steel & Iron Co.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh Forgings Co., Canonsburg, Pa.
Queen City Forging Co., Cincinnati, O.
Rhode Island Tool Co., Providence, R. I.
Rockford (Ill.) Drop Forge Co.
Storms Drop Forging Co., East Springfield, Mass.
Union Switch & Signal Co., Swissvale, Pa.
U. S. Body & Forging Co., Inc., Buffalo, N. Y.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

FORGINGS—Hammered
Erie (Pa.) Forge Co.
Machinery Forging Co., The, Cleveland, O.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Hollow
Erie (Pa.) Forge Co.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Co.
Erie (Pa.) Forge Co.
Midvale Co., The, Nicetown, Phila., Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

FORGINGS—Manganese Steel
Manganese Steel Forge Co., Phila.

FORGINGS—Upset
Bethlehem (Pa.) Steel Co.
Canton (O.) Forge & Axle Co.
Neely Nut & Bolt Co., Pitgh.
Rockford (Ill.) Drop Forge Co.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

FORMING AND COILING MACHINES
Yoder Co., The, Cleveland.

FOUNDRY EQUIPMENT AND SUPPLIES
Clifton Mchry. Co., Cincinnati.
National Engineering Company, Chicago.
Sly, W. W., Mfg. Co., Cleveland, O.

FROGS AND SWITCHES—Railway
Bethlehem (Pa.) Steel Co.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

FURNACES—Billet or Ingot Heating
Hagan, Geo. J., Co., Pittsburgh.
Naismith, Geo., & Son, Pitgh.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Blast
McKee, Arthur G., & Co., Cleve.
Pennsylvania Engng. Wks., New Castle Pa.

FURNACES—Crucible
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Electric Steel Melting
Detroit (Mich.) Electric Furnace Co.
Pittsburgh (Pa.) Electric Furnace Corp.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Forging
Best, W. N., Corp., 295 5th Ave., N.Y.C.
Holcroft & Co., Detroit.
Naismith, Geo., & Son, Pitgh.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Heat Treating, Automatic
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Rockwell, W. S., Co., 50 Church St., N.Y.C.

FURNACES—Heat Treating, Cyanide or Lead
American Electric Furnace Co., Boston.
Amer. Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., Milwaukee.

FURNACES—Heat Treating, Electric
American Electric Furnace Co., Boston.
Electric Furnace Co., Salem, Ohio.
Hagan, Geo. J., Co., Pittsburgh.
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Strong, Carlisle & Hammond Co., Cleve.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Heat Treating, Oil, Gas or Coal Fired
Amer. Gas Furnace Co., Elizabeth, N. J.
Anthony Co., The, Long Island City, N. Y.
Best, W. N., Corp., 295 5th Ave., N.Y.C.
Electric Furnace Co., Salem, Ohio.
Hagan, Geo. J., Co., Pittsburgh.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Smythe, S. R., Co., Inc., The, Pitgh.
Strong, Carlisle & Hammond Co., Cleve.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—High-Speed Steel
American Electric Furnace Co., Boston.
Naismith, Geo., & Son, Pitgh.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Non-Ferrous Melting
American Electric Furnace Co., Boston.
Detroit (Mich.) Electric Furnace Co.

FURNACES—Open Hearth
Criswell, James, Co., Pitgh.
Laughlin, Alex., & Co., Pitgh.
Naismith, Geo., & Son, Pitgh.
Smythe, S. R., Co., Inc., The, Pitgh.
Stevens, Arthur L., Corp., Chicago.
Swindell-Dressler Corp., Box 1753, Pitgh.

FURNACES—Recuperative
Naismith, Geo., & Son Pitgh.

FURNACES—Regenerative
Naismith, Geo., & Son, Pitgh.

FURNACES—Soaking Pit
Naismith, Geo., & Son, Pitgh.

FURNACES—Steel Mill
Naismith, Geo., & Son, Pitgh.

FURNACES—Tube Welding & Bending
Naismith, Geo., & Son, Pitgh.

FURNACES—Wire, Annealing & Galvanizing
Vaughn Mchry. Co., Cuyahoga Falls, O.

FURNITURE—Mill and Factory
Vitek Mfg. Co., Omaha, Neb.

FUSE METAL
Platt Bros. & Co., The, Waterbury, Ct.

GAGES—Plug and Ring
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

GAGES—Pressure and Vacuum
Bristol Co., Waterbury, Ct.

GAGES—Thread Lead
Jones & Lamson Mch. Co., Springfield, Vt.

GALVANIZING
Cattie Brothers Corp., Phila.
Cattie, Joseph P., & Bros., Phila.
Meaker Co., The, Chicago.
Newark (N. J.) Galvanizing Co.

GALVANIZING EQUIPMENT—Electro
Meaker Co., The, Chicago.

GALVANIZING PLANTS—For Sheets
Astna-Standard Eng. Co., Youngstown, O.
Meaker Co., The, Chicago.
United Engng. & Fdry. Co., Pitgh.

GALVANIZING & TINNING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

GAS—Exhausters
Stacey Engineering Co., The, Connersville, Ind.

GAS CLEANERS
Research Corp., 405 Lexington Ave., N. Y. C.

GAS FOR INDUSTRIAL USES
American Gas Ass'n., 420 Lexington Ave., New York City.

GAS PRODUCERS
Duff Patents Co., Inc., Pitgh.
Swindell-Dressler Corp., Box 1753, Pitgh.
Wood, R. D., & Co., Philadelphia.

GAS WASHERS
Brassert, H. A., & Co., Chicago.

GAS—Welding
Linde Air Prods. Co., The, 30 E. 42nd St., New York City.
Prest-O-Lite Co., Inc., The, 30 E. 42nd St., New York City.

GASKETS—Asbestos, Metal or Rubber
Johns-Manville Corp., 292 Madison Ave., New York City.

GASKETS—Felt
Booth Felt Co., Inc., The, 477-478 19th St., Bklyn.
Continental Felt Co., 890 B'way, N. Y. C.
Felters Co., The, Boston, Mass.

GATES—Blast
Rockwell, W. S., Co., 50 Church St., N.Y.C.

GATES—Fence
American Steel & Wire Co., Chicago.

GEAR CUTTING
Akron (O.) Gear & Engng. Co.
Bethlehem (Pa.) Steel Co.
Dundore Mfg. Co., Reading, Pa.
Earle Gear & Machine Co., Phila.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Gleason Wks., Rochester, N. Y.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works.
Pittsburgh (Pa.) Rolls Corp.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

GEAR CUTTING MACHINES
Brown & Sharpe Mfg. Co., Prov., R. I.
Gleason Wks., Rochester, N. Y.
Whiton, D. E., Mch. Co., New London, Ct.

GEAR PLANING MACHINES
Gleason Wks., Rochester, N. Y.

GEAR HOBBING MACHINES
Adams Co., The, Dubuque, Iowa
Barber-Colman Co., Rockford, Ill.
Gould & Eberhardt, Newark, N. J.

GEARS—Bevel
Earle Gear & Machine Co., Phila.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Gleason Wks., Rochester, N. Y.
Grant Gear Works, Boston
Hartford (Ct.) Special Mchry. Co.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works

GEARS—Cast

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Double Helical Cut

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
De Laval Steam Turbine Co., Trenton, N. J.

GEARS—Enclosed Herringbone Transmission

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Heat Treated

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Gleason Wks., Rochester, N. Y.

GEARS—Herringbone

Earle Gear & Machine Co., Phila.
Falk Corp., Milwaukee.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Machine Cut

Adams Co., The, Dubuque, Ia.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Gleason Wks., Rochester, N. Y.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

GEARS—Machine Molded

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Non-Metallic

Akron (O.) Gear & Engng. Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Grant Gear Works, Boston.
Horsburgh & Scott Co., Cleve.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works

GEARS—Rawhide

Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

GEARS—Speed Reducing

Cleveland (O.) Worm & Gear Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Palmer-Bee Co., Detroit.
Philadelphia (Pa.) Gear Works
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Spiral

Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.

GEARS—Spur

Boston Gear Works Sales Co., Norfolk Downs, Mass.
Earle Gear & Mach. Co., Phila.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Wks.

GEARS—Worm

Akron (O.) Gear & Engng. Co.
Cleveland (O.) Worm & Gear Co.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland, Ohio.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Worm, Speed Reducers

Cleveland (O.) Worm & Gear Co.
De Laval Steam Turbine Co., Trenton, N. J
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works.

GENERATORS—Acetylene

Air Reducing Sales Co., 60 East 42nd St., N. Y. C.
Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

GENERATORS—Electric, Second Hand

Archer & Baldwin, Inc., 126 Liberty St. N. Y. C.
Belyea Co., Inc., 147 W. 18th St., N Y. C.
Zelnicker in St. Louis, Mo.

GENERATORS—Electroplating

Meaker Co., The, Chicago.

GLUE HEATERS

Dart, E. M., Mfg. Co., Prov., R. I.

GOVERNORS—Air Compressor

Westinghouse Traction Brake Co., Wilmerding, Pa.

GRATING—Flooring, Sidewalk, Etc.

Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Irving Iron Wks. Co., L. I. City, N. Y.

GRATING—Steel

Blaw-Knox Co., Pittsburgh.

GRILLES—Metal Cane

Diamond Mfg. Co., Wyoming, Pa.

GRINDING MACHINE RESTS

Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

GRINDING AND POLISHING MACHINES

Black & Decker Mfg. Co., The, Towson, Md.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.
Calder, Geo. H., Lancaster, Pa.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Excelsior Tool & Mch. Co., East St. Louis, Ill
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.
Norton Co., Worcester, Mass.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

GRINDING MACHINES—Cam

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Cutter and Reamer

Landis Tool Co., Waynesboro, Pa.
Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Cylindrical

Brown & Sharpe Mfg. Co., Prov., R. I.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die

Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Disc

Gardner Mach. Co., Beloit, Wis.
Production Mch. Co., Greenfield, Mass.

GRINDING MACHINES—Drill

Sellers, William, & Co., Inc., Phila.

GRINDING MACHINES—Flexible Shaft

Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

GRINDING MACHINES—Internal

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES — Machine Knives

Atkins, E. C., & Co., Indianapolis, Ind.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

GRINDING MACHINES—Portable Electric

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Standard Electrical Tool Co., The, Cinci

GRINDING MACHINES—Portable Pneumatic

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The.

GRINDING MACHINES—Portable, Radial Swing

Mummert-Dixon Co., Hanover, Pa.

GRINDING MACHINES—Roll

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Second Hand

Morey & Co., Inc., 410 Broome St N. Y. C.

GRINDING MACHINES—Spring

Sleeper & Hartley, Inc., Worcester, Mass.

GRINDING MACHINES—Surface

Abrasive Machine Tool Co., F. Prov., R. I.
Blanchard Mach. Co., Cambridge, Mass.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.

GRINDING MACHINES—Swing Frame

Black & Decker Mfg. Co., The, Towson, Md.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.

GRINDING MACHINES—Tool

Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cinn.
Norton Co., Worcester, Mass.
Sellers, William, & Co., Inc., Phila.
Taylor & Fenn Co., Hartford, Ct.

GRINDING MACHINES—Universal

Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Simmons Mach. Tool Corp., Albany, N. Y.
Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Valve

Defiance (O.) Machine Works

GRINDING MACHINES—Vertical Surface

Blanchard Mach. Co., Cambridge, Mass

GRINDING WHEEL DRESSERS AND CUTTERS

Atkins, E. C., & Co., Indianapolis, Ind.
Calder, Geo. H., Lancaster, Pa.
Dickinson, Thos. L., 34 Gold St., N. Y. C.

GRINDING WHEELS

Atkins, E. C., & Co., Indianapolis, Ind.
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.
Norton Co., Worcester, Mass.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Simonds Saw & Steel Co., Fitchburg, Mass.
Springfield Mfg. Co., Bridgeport, Ct
Sterling Grinding Wheel Co., Tiffin, Ohio.

GUTTERS

Newport (Ky.) Rolling Mill Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES

Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.

HAMMER RAMS

Heppenstall Co., Pittsburgh.

HAMMERS—Air

Nazel Engrg. & Mch. Wks., Phila.

HAMMERS—Belt or Motor Driven (Forging)

Barbour-Stockwell Co., Cambridge, Mass.
Chambersburg (Pa.) Engng. Co.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
Nazel Engrg. & Mch. Wks., Phila.

HAMMERS—Belt or Motor Driven (Sheet Metal)

Quickwerk Co., The (Not Incorporated—H. Collier Smith, Owner), St. Mary's Ohio.
Yoder Co., The, Cleveland.

HAMMERS—Drop

Chambersburg (Pa.) Engng. Co.
Morgan Engng. Co., Alliance, O.
Standard Machinery Co., Auburn, R.I.

HAMMERS—Pneumatic

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The
Ingersoll-Rand Co., 11 B'way, N. Y. C.

HAMMERS—Pneumatic Forging

Sullivan Machinery Co., Chicago.

HAMMERS—Steam

Morgan Engng. Co., Alliance, O.

HANDLES—File

Kaslot Mfg. Co., Chicago.

HANGERS—Factory Door

Myers, F. E. & Bro. Co., Ashland, O.

HANGERS—Shaft

American Pulley Co., Philadelphia
Hyman, Joseph, & Sons, Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

HARDNESS TESTING MACHINES

Shore Instrument & Mfg. Co., Inc., Jamaica, L. I., N. Y.
Wilson-Maculen Co., Inc., 738 E. 142d St., N. Y. C.

HARDWARE—Carriage and Wagon

Clapp, E. D., Mfg. Co., The, 86 S. Division St., Auburn, N. Y.

HEADING MACHINES

National Mchry. Co., Tiffin, Ohio.

HEAT TREATING

General Machine Wks., York, Pa.
Parish Pressed Steel Co., Reading, Pa.

HEATERS—Unit

Buffalo (N. Y.) Forge Co., 492 B'way.

HEATING AND VENTILATING APPARATUS

Buffalo (N. Y.) Forge Co., 492 B'way

HINGES—Wrought Brass Butt

Veeder-Root, Inc., Hartford, Ct.

HINGES—Wrought Steel & Brass

Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.

HOBS

Barber-Colman Co., Rockford, Ill.

HOISTING MACHINES

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Air

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Dake Engine Co., Grand Haven, Mich.
Detroit (Mich.) Hoist & Mach. Co.
Hanna Eng. Works, Chicago.
Independent Pneumatic Tool Co., Chicago.
Ingersoll-Rand Co., 11 B'way, N. Y. C.
Ridgway, Craig & Son Co., Coatesville, Pa.

HOISTS—Chain

American MonoRail Co., The, Cleveland.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.

HOISTS—Electric

American Crane Co., Inc., The, Friendship, N. Y.
American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
American MonoRail Co., The, Cleveland.
Box Crane & Hoist Corp., Phila.
Detroit (Mich.) Hoist & Mach. Co.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Mallory Machry. Corp., Baltimore.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Payne, N. B., & Co., 25 Church St., N. Y. C.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Roeper Crane & Hoist Works, Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Electric Traveling

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Box Crane & Hoist Corp., Phila.
Cleveland Electric Tramrail, Wickliffe, O.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Monorail

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Euclid (O.) Crane & Hoist Co.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Skip

Bartlett, C. O. & Snow Co., Cleve.

HOLDERS—Nipple

Curtis & Curtis Co., Bridgeport, Ct.

HONING MACHINES

Barnes Drill Co., Inc., Rockford, Ill.

HOOPS—Wire

American Steel & Wire Co., Chicago.

HOOPS AND BANDS

Ryerson, Jos. T., & Son, Inc., Chicago.
Sharon (Pa.) Steel Hoop Co.

HOSE—Air, Oil, Steam and Water

New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

HYDRANTS—Fire

Wood, R. D., & Co., Philadelphia.

HYDRAULIC MACHINERY

American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Anker Engng. Co., Phila.
Bethlehem (Pa.) Steel Co.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Chambersburg (Pa.) Engrg. Co.
Elmes, Chas. F., Engrg. Wks., Chicago.
French Oil Mill Mchry. Co., Piqua, O.
Lake Erie Engng. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Watson-Stillman Co., 71 West St., N. Y. C.
Wood, R. D., & Co., Philadelphia.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

HYDROGEN
International Oxygen Co., Newark, N. J.

HYPODERMIC NEEDLE TUBING
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

ICE HANDLING MACHINERY
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

INDUCTION STEEL ELECTRIC
Heppenstall Co., Pittsburgh.

INGOT MOLDS
Bethlehem (Pa.) Steel Co.
Shenango Furnace Co., Pittsburgh.
Valley Mould & Iron Corp., Hubbard, O.

INGOTS—Aluminum
Erdle Perforating Co., Rochester, N. Y.

INGOTS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

INSTRUMENTS—Recording
Bristol Co., Waterbury, Ct.

INSULATION—Magnesia
Johns-Manville Corp., 292 Madison Ave., New York City.

IRON—Chain
Bethlehem (Pa.) Steel Co.

IRON—(Genuine Open Hearth Iron)
Newport (Ky.) Rolling Mill Co.

IRON—Stainless
Firth-Sterling Steel Co., McKeesport, Pa.

IRON—Staybolt
Bethlehem (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

JIGS, FIXTURES, TOOL, ETC.—See Tools, Jigs, Fixtures, Etc.

KEYS—Machine
Buffalo (N. Y.) Mch. Key Co.

KEYSEATING MACHINES
Baker Bros., Inc., Toledo, O.

LACING—Belt, Rawhide or Leather
Graton & Knight Co., Worcester, Mass.

LATHE DOGS
West Steel Casting Co., The, Cleveland.
Williams, J. H., & Co., Buffalo, N. Y.

LATHES—Automatic
Bullard Co., The, Bridgeport, Ct.
Jones & Lamson Mch. Co., Springfield, Vt
LeBlond, R. K., Mch. Tool Co., Cinn.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Co., Hartford, Conn.

LATHES—Bench
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Corp., Boston

LATHES—Chucking
Jones & Lamson Mach. Co., Springfield, Vt.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cinn.

LATHES—Engine
American Tool Works Co., Cinci.
Cincinnati (O.) Lathe & Tool Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
LeBlond, R. K., Mch. Tool Co., Cinn
Lodge & Shipley Mch. Tool Co., Cinci.
Monarch Mch. Tool Co., The, Sidney, O.
Osborne & Sexton Mchry. Co., Columbus, O
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Ryerson, Jos. T., & Son, Inc., Chicago.

LATHES—Roll
United Engrg. & Fdy. Co., Ptgh.

LATHES—Second-Hand
Eastern Mchry. Co., Cincinnati.
Machine Tools Sales Co., Phila., Pa.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N.Y.C.
Russell Mch. Co., Ptgh.
Simmons Mach. Tool Corp., Albany, N. Y.

LATHES—Spinning
Adriance Mach. Works, Inc., 82 Richard St., Brooklyn, N. Y.

LATHES—Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Bardons & Oliver, Cleve.
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Lathe & Tool Co.
Jones & Lamson Mch. Co., Springfield, Vt.

LEAD BURNING
Gross Lead Burning & Coating Corp. Cleveland.

LEAD BURNING APPARATUS
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

LEAD-LINED APPARATUS
Gross Lead Burning & Coating Corp., Cleveland.

LEATHER—Cup
Graton & Knight Co., Worcester, Mass.

LEATHER—Hydraulic
Graton & Knight Co., Worcester, Mass.

LEVELS—Precision Machine Aligning
Universal Boring Mch. Co., Hudson, Mass.

LEVELING MACHINES
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

LIMESTONE—Low Silica
Baker, J. E., Co., York, Pa.

LINING—Converter
Edge Hill Silica Rock Co., New Brunswick, N. J.

LINING—Cupola
Edge Hill Silica Rock Co., New Brunswick, N. J.

LIQUIDATORS
Llewelyn, Thomas J., & Co., Ptgh.

LOCK WASHER MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass

LOCOMOTIVES—Electric
Atlas Car & Mfg. Co., Cleve.

LOCOMOTIVES—Gasoline
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Industrial
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., Cleve.

LUGS—Terminal
Wolverine Tube Co., Detroit.

LUMBER—Creosoted or Zinc Treated
Century Wood Preserving Co., Ptgh.

MACHINE WORK
Cavagnaro, John J., Harrison, N. J.
Cowdrey, C. H., Machine Co., 30 Summer St., Fitchburg, Mass.
Fabricated Steel Products Co., Wheeling, W. Va.
Franklin Mch. Co., Providence, R. I.
General Mach. Works, York, Pa.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
Porter Mch. Co., Inc., Jersey City, N. J.
Royersford (Pa.) Fdry. & Mch. Co., Inc.

MACHINERY DEALERS
Donahue Steel Prod. Co., 1609 W. 74th St., Chicago, Ill.
Dony, D. E., Rochester, N. Y.
Eastern Mchry. Co., Cincinnati.
Essley, E. L., Mchry. Co., Chicago.
General Mchry. Corp., Boston, Mass.
Hill, Clarke & Co. of Chicago, 647 W Washington Blvd., Chicago, Ill.
Johnson, Wm. C., & Sons Mchry. Co. St. Louis, Mo.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
MacCabe, T. B., Philadelphia, Pa.
Machine Tools Sales Co., Phila., Pa.
Marr-Galbreath Mchry. Co., Ptgh.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N.Y.C.
O'Brien Mchry. Co., Phila.
Prussian, M., Mchry. Co., Detroit.
Reliance Mchry. Sales Co., Ptgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Schoonmaker, A. G., & Sons, Inc., 30 Church St., New York City.
Simmons Mach. Tool Corp., Albany, N. Y.
Smith, H. A., Mchry. Co., Syracuse, N. Y.
Victor Mchry. Exchange, 251 Centre St., New York City.
Wachs-Gregg & Co., Chicago.
White, A. D. Machry. Co., Chicago.
Zelnicker in St. Louis, Mo.

MACHINISTS—Contracting
Konigslow, Otto, Mfg. Co., Cleve.

MAGNESITE—Brick or Dead Burnt
Lavino, E. J., & Co., Phila.

MAGNETS—Electro Industrial
Dings Magnetic Separator Co., Milwaukee.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., Cleve.
Ohio Electric Mfg. Co., Cleve.

MALLETS
Kaalot Mfg. Co., Chicago.

MANHOLE STEPS
Nicetown Plate Washer Co., Inc., Phila.

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford Ct.

METAL SPECIALTIES
American Pulley Co., Philadelphia
Amer. Spring & Mfg. Corp., Holley, Mich.
Bossert Corp., The, Utica, N. Y.
Cuyahoga Spring Co., Cleve.
Detroit (Mich.) Metal Specialty Corp.
Globe Mach. & Stpg. Co., Cleve.
Peerless Novelty Co., Grand Haven, Mich.
Torrington (Ct.) Co.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
York (Pa.) Corrugating Company.

METALINE
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

MICA SCHIST
Edge Hill Silica Rock Co., New Brunswick, N. J.

MILLING CUTTER BLADES
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

MILLING MACHINES—Automatic
Pratt & Whitney Co., Hartford, Conn.

MILLING MACHINES—Horizontal
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Defiance (O.) Mch. Wks.
Kearney & Trecker Corp., Milwaukee.

MILLING MACHINES—Plain
Kearney & Trecker Corp., Milwaukee.
Ryerson, Jos. T., & Son, Inc., Chicago.

MILLING MACHINES—Planer Type
Sellers, William, & Co., Inc., Phila.

MILLING MACHINES—Second-Hand
Eastern Mchry. Co., Cincinnati.
Simmons Mach. Tool Corp., Albany, N. Y.

MILLING MACHINES—Universal
Brown & Sharpe Mfg. Co., Prov., R. I.
Ryerson, Jos. T., & Son, Inc., Chicago.

MILLING MACHINES—Vertical
Reed-Prentice Corp., Worcester, Mass.

MIXING MACHINES—Sand
Bartlett, C. O. & Snow Co., Cleve.
National Engineering Co., Chicago.

MOLDING MACHINES—Jarring (Air)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.

MOLDING MACHINES—Rollover (Hand and Power Operated)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.

MOLDING MACHINES—Sand Throwing
Beardsley & Piper Co., Chicago, Ill.

MOLDING MACHINES—Stripping Plate
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.

MONORAIL SWITCHES AND TURNTABLES
Reading (Pa.) Chain & Block Corp.

MONORAIL—Overhead
American MonoRail Co., The, Cleveland.
Reading (Pa.) Chain & Block Corp.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Century Electric Co., St. Louis, Mo.
Leland Electric Co., The, Dayton, Ohio.
Ohio Electric Mfg. Co., Cleve.
Robbins & Myers, Inc., Springfield, Ohio.

MOTORS—Electric, Second-Hand
Archer & Baldwin, Inc., 126 Liberty St., N. Y. C.
Belyea Co., Inc., 147 W. 18th St., N. Y.
Land, L. J., 207 Centre St., N. Y. C.
O'Brien Machry. Co., Phila.
Sachsenmaier, Geo., Co., Phila., Pa.

MOULDINGS—Cold Rolled
Britesun, Inc., Chicago.

NAILS—Cement Coated
American Steel & Wire Co., Chicago.

NAILS—Galvanized
American Steel & Wire Co., Chicago.

NAILS—Wire
American Steel & Wire Co., Chicago.
Bethlehem (Pa.) Steel Co.
Wheeling (W. Va.) Steel Corp.
Youngstown (O.) Sheet & Tube Co.

NICKEL ANODES—Rolled or Cast
Seymour (Ct.) Mfg. Co.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 E. 42nd St., New York City.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., Hartford, Ct.

NUT MAKING MACHINERY
Budd-Ranney Eng. Co., The, Columbus, O.
National Mchry. Co., Tiffin, Ohio.

NUTS—Acorn
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Western Screw Products Co., St. Louis.

NUTS—Castellated
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Western Screw Products Co., St. Louis.

NUTS—Cold Punched
Milton (Pa.) Mfg. Co.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Hot Pressed
Milton (Pa.) Mfg. Co.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Milled
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Pittsburgh (Pa.) Screw & Bolt Corp.
Westfield (Mass.) Nut Co.

NUTS—Semi-Finished
Milton (Pa.) Mfg. Co.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Westfield (Mass.) Nut Co.

NUTS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

ORES—Chrome, Lump and Ground
Lavino, E. J., & Co., Phila.

ORES—Iron
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Pilling & Co., Inc., Phila.
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.
Shenango Furnace Co., Pittsburgh.

ORES—Manganese
Lavino, E. J., & Co., Phila.

OVENS—Baking
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
McCann-Harrison Corp., Cleve.
Young Bros. Co., Detroit.

OVENS—Core and Mold
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Young Bros. Co., Detroit.

OVENS—Drying
Detroit (Mich.) Sheet Metal Wks.
Drying Systems, Inc., Chicago, Ill.
McCann-Harrison Corp., Cleve.
Young Bros. Co., Detroit.

OVENS—Enameling and Japanning
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
McCann-Harrison Corp., Cleve.
Young Bros. Co., Detroit.

OVERHEAD CARRYING EQUIPMENT—See Monorail—Overhead

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
International Oxygen Co., Newark, N. J.
Linde Air Prods. Co., The, 30 E. 42nd St., New York City.

PACKING—Leather
Graton & Knight Co., Worcester, Mass.
Watson-Stillman Co., 71 West St., N. Y

PACKING—Sheet, Asbestos or Rubber
Johns-Manville Corp., 292 Madison Ave., New York City.

PANS—Grinding
National Engineering Co., Chicago.

PATENT ATTORNEYS
Boyle, John, Jr., Washington, D. C.

PATENTING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

PATTERNS—Wood and Metal
Bascom & Co., Troy, N. Y.

PERFORATED METAL
Chicago Perforating Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

PHOSPHOR—Copper
Phosphor Bronze Smelting Co., Phila.

PHOSPHORIZERS
McCullough-Dalzell Crucible Co., Ptgh.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.

PICKLING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Meaker Co., The, Chicago.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Company.
Chateaugay Ore & Iron Co., 26 Liberty St., N. Y. C.
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Lavino, E. J., & Co., Phila.
Pilling & Co., Inc., Phila.
Republic Steel Corp., Youngstown, Ohio.
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.
Shenango Furnace Co., Pittsburgh.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & R.R. Co., Birmingham, Ala.
Walter-Wallingford & Co., Cincinnati.

PIG IRON—Charcoal
Superior Charcoal Iron Co., Grand Rapids, Mich.

PIG IRON—Low Phosphorus
Chateaugay Ore & Iron Co., 26 Liberty St., N. Y. C.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

PILING—Steel Sheet
Bethlehem (Pa.) Steel Company.

PINIONS—Wire and Rod
Rathbone, A. B., & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland, O.

PIPE—Cast Iron, B. & S. and Flanged
Wood, R. D., & Co., Philadelphia.

PIPE—Forged Steel
Kellogg, M. W., Co., The, 225 Bdway., N. Y. C.

PIPE—Fusion Welded
Petroleum Iron Wks. Co., Sharon, Pa.

PIPE—Genuine Wrought Iron
Keating, E. F., Co., 452 Water St. N. Y. C.

PIPE—Hammer Welded
National Tube Co., Pittsburgh.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry and N. 13th St., Bklyn., N. Y.
Atlantic Steel & Pipe Corp., Stewart Ave. and Meadow St., Brooklyn, N. Y.
Greenpoint Iron & Pipe Co., Inc., 187-197 Maspeth Ave., Bklyn, N. Y.
L. & D. Pipe Supply Co., Inc., 1100 Flushing Ave., Bklyn, N. Y.
Marine Metal & Supply Co., 167 South St., N. Y. C.

PIPE—Riveted Steel
Abendroth & Root Mfg. Co., Newburgh, N. Y.

PIPE—Seamless Steel

PIPE—Spiral Riveted
Abendroth & Root Mfg. Co., Newburgh, N. Y.
Taylor Forge and Pipe Works, Chicago.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Co.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Republic Steel Corp., Youngstown, Ohio.
Wheeling (W. Va.) Steel Corp.
Youngstown (O.) Sheet & Tube Co.

PIPE—Wrought Iron
Keating, E. F., Co., 452 Water St., N. Y. C.

PIPE BENDING MACHINES
Newbold, R. S., & Son Co., Norristown, Pa.

PIPE COVERING—Asbestos
Johns-Manville Corp., 292 Madison Ave., New York City.

PIPE CUTTING MACHINES
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
Newbold, R. S., & Son Co., Norristown, Pa.

PIPE CUTTING AND THREADING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Curtis & Curtis Co., 337 Garden St., Bridgeport, Ct.
Jarecki Mfg. Co., Erie, Pa.
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
Pipe Machry. Co., The, Cleveland.
Saunders', D., Sons, Yonkers, N. Y.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PIPE FITTINGS
Jarecki Mfg. Co., Erie, Pa.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.

PISTON RODS
Heppenstall Co., Pittsburgh.

PLANING MACHINES—Metal
American Tool Works Co., Cinci.
Cincinnati (O.) Planer Co., The.
Cleveland (O.) Planer Co., The.
Consolidated Mch. Tool Corp. of America Rochester, N. Y.
Gray, G. A., Co., Cinci.
Liberty Mch. Tool Co., Hamilton, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sellers, William, & Co., Inc., Phila.

PLANING MACHINES—Open Side
Cincinnati (O.) Planer Co., The.
Cleveland (O.) Planer Co., The.
Gray, G. A., Co., Cinci.
Liberty Mch. Tool Co., Hamilton, O.

PLANING MACHINES—Second Hand
Miles Mchry. Co., Saginaw, W. S., Mich.

PLANTS FOR SALE
Rockaway (N. J.) Rolling Mill

PLATERS' CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., 22 Thames St., N. Y.

PLATES—Fellos
Wrought Washer Mfg. Co., Milwaukee.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.
American Pressed Steel Co., Phila.
Carnegie Steel Co., Ptgh.
Central Iron & Steel Co., Harrisburg, Pa.

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Pressed Steel Co., Phila., Pa.
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.
Central Iron & Steel Co., Harrisburg, Pa.
Illinois Steel Co., Chicago, Ill.
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. Birmingham, Ala.
Youngstown (O.) Sheet & Tube Co.

PLATES—Manganese Steel
Manganese Steel Forge Co., Phila.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

PLATFORMS—Skid
Lewis-Shepard Co., 122 Walnut St. Watertown Station, Boston.

PLATING—Electro
Meaker Co., The, Chicago.

PLATING EQUIPMENT—Automatic
Meaker Co., The, Chicago.

PLATING EQUIPMENT—Chromium
Meaker Co., The, Chicago.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., Pontiac, Mich.

POINTING & THREADING MACHINERY
Economy Engng. Co., The, Willoughby, O.

POLISHING & BUFFING MACHINES
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Divine Brothers Co., Utica, N. Y.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.

POLISHING MACHINES—Belt
Production Mch. Co., Greenfield, Mass.

POLISHING WHEELS
Divine Brothers Co., Utica, N. Y.

POSTS—Steel Fence
American Steel & Wire Co., Chicago.

POWER TRANSMITTING MACHINERY
American Pulley Co., Philadelphia
Falk Corp., Milwaukee.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

POWER UNITS—Gasoline, Electric
Ready-Power Co., Detroit, Mich.

PREHEATERS—Air
Blaw-Knox Co., Pittsburgh.

PRESS ATTACHMENTS
Littell, F. J., Mach. Co., Chicago.

PRESSED METAL PARTS
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Detroit (Mich.) Metal Specialty Corp.
Peerless Novelty Co., Grand Haven, Mich.

PRESSED STEEL PARTS
American Pulley Co., Philadelphia
Bossert Corp., The, Utica, N. Y.
Detroit (Mich.) Metal Specialty Corp.
Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Peerless Novelty Co., Grand Haven, Mich.
Pennsylvania Car Co., Kansas City, Kan.
Worcester (Mass.) Pressed Steel Co.
York (Pa.) Corrugating Co.

PRESSES—Bending or Straightening
Watson-Stillman Co., 71 West St., N. Y

PRESSES—Die
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Drop
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Standard Machinery Co., Auburn, R. I.

PRESSES—Extrusion
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Foot
Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Shuster, F. B., Co., New Haven, Ct.
Taylor & Fenn Co., Hartford, Ct.

PRESSES—Forging
Lucas Mch. Tool Co., Cleve.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forging
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., Ptgh.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forming and Bending
Cincinnati (O.) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Hot and Cold Plate
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Hydraulic
Bethlehem (Pa.) Steel Co.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Elmes, Chas. F., Engrg. Works, Chicago.
French Oil Mill Machry. Co., Piqua, O.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Lake Erie Engng. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
Rock River Engng. Co., Janesville, Wis.
Southwark Fdry. & Mach. Co., Phila.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PRESSES—Multiple Plunger
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

PRESSES—Percussion
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

PRESSES—Power
Adriance Machine Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
Hyman, Joseph, & Sons, Phila.
Manville, E. J., Mach. Co., Waterbury, Ct.
Minster (O.) Machine Co.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.
Obi, George A., & Co., Inc., Newark, N. J.
Pels, Henry, & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Mach. & Tool Co.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.
Zeh & Hahnemann Co., Newark, N. J

PRESSES—Roofing and Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Scrap Bundling
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Standard Machinery Co., Auburn, R. I.

PRESSES—Trimming
Toledo (O.) Mch. & Tool Co.

PULLEY MACHINERY
Avey Drilling Mch. Co., Cincinnati, O.

PULLEYS—Belt (Pressed Steel)
American Pulley Co., Philadelphia

PULLEYS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PULLEYS—Iron, Solid and Split
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., Milwaukee.

PULLEYS—Motor and Machine (Compressed Spruce)
American Pulley Co., Philadelphia.

PULLEYS—Steel, Rim Solid and Split
Hyman, Joseph, & Sons, Phila.

PULVERIZERS
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleve.
Bethlehem (Pa.) Steel Co.

PULVERIZERS—Coal
Bartlett, C. O. & Snow Co., Cleve.
Bethlehem (Pa.) Steel Co.

PUMPS—Boiler Feed
Manistee (Mich.) Iron Works Co.
Morris Mch. Works, Baldwinsville, N. Y.

PUMPS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee.
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co. (Cameron), 11 B'way, N. Y. C.
Manistee (Mich.) Iron Works Co.
Morris Mach. Works, Baldwinsville, N. Y.
Penna. Pump & Compressor Co., Easton, Pa.

PUMPS—Electric
Myers, F. E., & Bro. Co., Ashland, O.

PUMPS—Hand & Power
Myers, F. E., & Bro. Co., Ashland, O.

PUMPS—Hydraulic
American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Elmes, Chas. F., Engrg. Works, Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Southwark Fdry. & Mch. Co., Phila.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PUMPS—Pneumatic Air Lift
Sullivan Machinery Co., Chicago.

PUMPS—Rotary
Stacey Engineering Co., The, Connersville, Ind.

PUMPS—Vacuum
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Machinery Co., Chicago.

PUNCHES—Pneumatic
Hanna Engineering Wks. Chicago.

PUNCHES AND DIES
Cleveland (O.) Punch & Shear Wks. Co.
Marchant, Geo. F., Co., Chicago.
Richards, I. P., Co., Providence, R. I.

PUNCHING AND SHEARING MACHINES
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Excelsior Tool & Mch. Co., East St. Louis, Ill.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, O.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Rock River Engng. Co., Janesville, Wis.
Ryerson, Jos. T., & Son, Inc., Chicago.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.
Southwark Fdry. & Mch. Co., Phila.
Thomas Spacing Mach. Co., Ptgh.
Whitney Metal Tool Co., Rockford, Ill.

PURIFIER—Steel
Refined Steel Products Co., Pittsburgh.

PURIFIERS—Oil.
De Laval Steam Turbine Co., Trenton, N. J.
National Acme Co., The, Cleveland.

PURIFIERS—Steam
Blaw-Knox Co., Pittsburgh.

PYROMETERS—Indicating
Bristol Co., Waterbury, Ct.
Hoskins Mfg. Co., Detroit.
Wilson-Maeulen Co., Inc., 738 E. 143d St., N. Y. C.

PYROMETERS—Purifiers, Gas
Research Corp., 405 Lexington Ave., N. Y. C.

RACKS—Industrial Storage
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

RAIL BONDS
American Steel & Wire Co., Chicago.

RAIL SPLICE BARS
Ames, W., & Co., Jersey City, N. J.

RAILS
Bethlehem (Pa.) Steel Co.
Cohen, Louis, & Son, Wilkes-Barre, Pa.
Foster, L. B., Co., Ptgh.
Frank, M. K., Pittsburgh
Illinois Steel Co., Chicago, Ill.
Lindheimer, S. W., Inc., Chicago.
Morrison Railway Supply Corp., Buffalo, N. Y.
Robinson & Orr, Pittsburgh.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

RAILS—Relaying
Continental Iron & Steel Co., 33 Rector St., N. Y. C.
Foster, L. B., Co., Ptgh.
Frank, M. K., Pittsburgh, Pa.
Perry, Buxton, Doane Co., Boston.
Sherwood, E. C., 48 Church St., N. Y. C.
Zelnicker in St. Louis, Mo.

RAILWAY EQUIPMENT AND SUPPLIES
Foster, L. B., Co., Ptgh.
Johns-Manville Corp., 292 Madison Ave., New York City.
Lindheimer, S. W., Inc., Chicago.
Morrison Railway Supply Corp., Buffalo, N. Y.
Zelnicker in St. Louis, Mo.

REAMERS—Adjustable and Expansion
Barber-Colman Co., Rockford, Ill.
Brubaker, W. L., & Bros. Co., 50 Church St., N. Y. C.
Cleveland (O.) Twist Drill Co.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

REFRACTORIES—See Brick—Cement—Facing Clay and Fire Clay

REGULATORS—Compressed Gas
Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

RINGS—Iron or Steel
Akron-Selle Co., Akron, Ohio.
Edgewater Steel Co., Pittsburgh.
Heppenstall Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Milwaukee (Wis.) Forge & Mch. Co.
Vulcan Steam Forging Co., Buffalo, N. Y.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

RINGS—Welded
American Welding & Mfg. Co., Warren, O.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleve.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.

RIVET SETS
Cleveland (O.) Punch & Shear Wks. Co.
Hunter Saw & Mch. Co., 5660 Butler St., Pgh.
Marcuant, Geo. F., Co., Chicago.

RIVETING MACHINES
Allen, John F., Co., 372 Gerard Ave., N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Hanna Engrg. Works, Chicago.
Shuster, F. B., Co., New Haven, Conn.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

RIVETS
Bethlehem (Pa.) Steel Co.
Clark Bros. Bolt Co., Milldale, Conn.
Neely Nut & Bolt Co., Pgh.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.

RODS—Drill
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.

RODS—Nickel Silver
Seymour (Ct.) Mfg. Co.

RODS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

RODS—Welding, Manganese Steel
Manganese Steel Forge Co., Phila.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

RODS—Wire
American Steel & Wire Co., Chicago.
Washburn Wire Co., Inc., Phillipsdale, R. I.
Youngstown (O.) Sheet & Tube Co.

ROLLING MACHINERY—Cold Rolling
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Leveler
Aetna-Standard Eng. Co., Youngstown, O.
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Metal
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Sheet Oiling
Aetna-Standard Eng. Co., Youngstown, O.
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MILL MACHINERY
Aetna-Standard Eng. Co., Youngstown, O.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Hyde Park (Pa.) Fdry. & Mch. Co.
Morgan Engineering Co., Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdry. Co., Pgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

ROLLS—Alloy Steel
Duquesne Steel Fdry. Co., Pittsburgh, Pa.
Pittsburgh (Pa.) Rolls Corp.
United Engrg. & Fdry. Co., Pgh.

ROLLS—Bending and Straightening
Bertsch & Co., Cambridge City, Ind.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Hendley & Whittemore Co., Beloit, Wis.
Lake Erie Engng. Corp., Buffalo, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.
Rock River Engng. Co., Janesville, Wis.
Ryerson, Jos. T. & Son, Inc., Chicago.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Southwark Foundry & Machine Co., Phila.

ROLLS—Galvanizing
Erie (Pa.) Forge Co.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Eng. Co., Youngstown, O.
American Steel Foundries, Chicago.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Hyde Park (Pa.) Fdry. & Mach. Co.
National Roll & Fdry. Co., Avonmore, Pa.
Pittsburgh (Pa.) Rolls Corp.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
United Engng. & Fdry. Co., Pittsburgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.

ROOFING—Cement Tile
American Cement Tile Mfg. Co., 803 Oliver Bldg., Pgh.

ROOFING—Concrete
Austin Co., The, Cleveland.

ROOFING—Special Copper Bearing Steel
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Corrugated and Plain
Johns-Manville Corp., 292 Madison Ave., New York City.
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Youngstown (O.) Sheet & Tube Co.

ROOFING AND SIDING—(Genuine Open Hearth Iron)
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Iron and Steel
Newport (Ky.) Rolling Mill Co.

ROPE—Power Transmission
Allis-Chalmers Mfg. Co., Milwaukee.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.

RUST REMOVING
American Chemical Paint Co., Ambler, Pa.

SAND—Core
Industrial Silica Corp., Youngstown, Ohio.

SAND—Furnace Bottom
Industrial Silica Corp., Youngstown, Ohio.

SAND—Molding
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

SAND—Sand Blast
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.

SAND—Steel Molding
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.

SAND BLAST EQUIPMENT AND MACHINES
Arcade Mfg. Co., Freeport, Ill.
Mott Sand Blast Mfg. Co., Inc., Chi.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., Cleveland, O.

SAND CUTTING AND SCREENING MACHINES
Bartlett, C. O. & Snow Co., Cleve.

SAND HANDLING EQUIPMENT
Bartlett, C. O. & Snow Co., Cleve.
Beardsley & Piper Co., Chicago, Ill.
Hayward Co., 50 Church St., N. Y. C.
National Engineering Co., Chicago.

SAND MILLS
Bartlett, C. O. & Snow Co., Cleve.
National Engineering Co., Chicago.

SAND RAMMERS
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

SAWING MACHINES—Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Cochrane-Bly Co., Rochester, N. Y.
Earle Gear & Mch. Co., Phila.
Espen-Lucas Mach. Works, Phila.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.
Tannewitz Wks., The, Grand Rapids, Mich.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Phila.
Simonds Saw & Steel Co., Fitchburg, Mass.
Tannewitz Wks., The, Grand Rapids, Mich.

SAWS—Circular, Rip and Cutoff
Atkins, E. C., & Co., Indianapolis, Ind.
Cochrane-Bly Co., Rochester, N. Y.

SAWS—Cold Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Hunter Saw & Mch. Co., 5660 Butler St., Pgh.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis, Ind.
Disston, Henry & Sons, Inc., Philadelphia.
Ryerson, Jos. T., & Son, Inc., Chicago.

SAWS—Hack Saw Blades
Atkins, E. C., & Co., Indianapolis, Ind.
Darwin & Milner, Inc., Cleveland.
Peerless Mch. Co., Racine, Wis.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Disston, Henry & Sons, Inc., Philadelphia.
Hunter Saw & Mch. Co., 5660 Butler St., Pgh.

SAWS—Inserted Tooth, Cold
Disston, Henry, & Sons, Inc., Phila.
Hunter Saw & Mch. Co., 5660 Butler St., Pittsburgh.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS—Milling
Disston, Henry & Sons, Inc., Phila.

SAWS—Screw Slotting
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Sliding Frame
United Engrg. & Fdry. Co., Pgh.

SCALES
Buffalo (N. Y.) Scale Co., 1202 Niagara St.

SCRAP—Iron and Steel
Perry, Buxton, Doane Co., Boston.
Potts, Henry, & Co., Phila.

SCREENS—Perforated Metal
Chicago Perforating Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

SCREENS—Woven Wire
Manganese Steel Forge Co., Phila.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Bristol, Ct.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Brown Bag Filling Mch. Co., Fitchburg, Mass.
Cleveland (O.) Cap Screw Co., The.
Corbin Screw Corp., New Britain, Ct.
Eastern Mch. Screw Corp., New Haven, Ct.
Ferry Cap & Set Screw Co., Cleveland.
Hartford (Ct.) Machine Screw Co.
Luers Bros. Mchry. & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.
Newton Mfg Co, Plainville, Ct.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Penn Screw & Machine Works, Phila.
Progressive Mfg. Co., Torrington, Ct.
Screw Mch. Products Corp., Prov., R. I.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Western Screw Products Co., St. Louis, Mo.

SCREW MACHINERY—Automatic
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW MACHINERY—Automatic Wood
Cook, Asa S., Co., Hartford, Ct.

SCREW MACHINERY—Hand
Jones & Lamson Mch. Co., Springfield, Vt.

SCREW MACHINERY—Multiple Spindle
Acme Machine Tool Co., Cincinnati, Ohio.
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREWS—CAP
Clark Bros. Bolt Co., Milldale, Conn.
Cleveland (O.) Cap Screw Co.
Corbin Screw Corp., New Britain, Ct.
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Western Screw Products Co., St. Louis, Mo.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland, O.

SCREWS—Cold Headed
Cleveland (O.) Cap Screw Co., The.

SCREWS—Machine
Corbin Screw Corp., New Britain, Ct.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

SCREWS—Safety Set
Allen Mfg. Co., The, Hartford, Ct.
Bristol Co., Waterbury, Ct.
Progressive Mfg. Co., Torrington, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS—Set
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS, Socket, Head, Cap.
Allen Mfg. Co., The, Hartford, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., The, Cleveland.

SCREWS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.

SCREWS—Wood
Corbin Screw Corp., New Britain, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

SECOND-HAND MACHINERY — See Clearing House Section
Armel, James P., Pgh.
Crawbuck, John D., Co., Pittsburgh, Pa.
Donahue Steel Prod. Co., 1609 W. 74th St., Chicago, Ill.
Eastern Mchry. Co., Cincinnati.
Easley, E. L., Mchry. Co., Chicago.
Highway Truck Parts Co., Indianapolis, Ind.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
Ideal Machinery Co., Plainville, Ct.
Johnson, Wm. C., & Sons, Mchry. Co., St. Louis, Mo.
Leahy, John W., Danbury, Conn.
Llewelyn, Thomas J., & Co., Pgh.
Lodge & Shipley Mch. Tool Co., Cincl.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
MacCabe, T. B., Phila.
Machine Tools Sales Co., Phila., Pa.
Marr-Galbreath Mchry. Co., Pgh.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N. Y. C.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
O'Brien Machry. Co., Phila.
Osborne & Sexton Mchry. Co., Columbus, O.
Prussian M. Mchry Co., Detroit.
Reliance Mchry. Sales Co., Pgh.
Ross Power Equip. Co., Indianapolis.
Russell Mch. Co., Pgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully-Jones & Co., Chicago.
Simmons Mach. Tool Corp., Albany, N. Y.
Stewart-Warner Corp., Chicago, Ill.
White, A. D. Machry. Co., Chicago.
Zelnicker in St. Louis, Mo.

SEPARATORS—Gas
Research Corp., 405 Lexington Ave., N. Y. C.

SEPARATORS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., Milwaukee.
Ohio Electric Mfg. Co., Cleveland.

SEPARATORS—Oil
Ransohoff, N., Inc., Cinn., Ohio.

SHAFTING—Cold Drawn
Cumberland (Md.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Pgh.

SHAFTING—Smooth Forged or Rough Turned
Erie (Pa.) Forge Co.

SHAFTING—Steel
Bethlehem (Pa.) Steel Co.
Bliss & Laughlin, Inc., Harvey, Ill.
Cumberland (Md.) Steel Co

SHAFTING—Tubular Material For
National Tube Co., Pittsburgh.

SHAFTING—Turned and Polished
Cumberland (Md.) Steel Co.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh

SHAPES—Cold Drawn
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Pgh.

SHAPES—Cold Rolled
Britesun, Inc., Chicago.

SHAPES—Steel
Phoenix Iron Co., Phila.
Ryerson, Jos. T., & Sons, Inc., Chicago.

SHAPING MACHINES—Horizontal
American Tool Works Co., Cincl.
Cincinnati (O.) Shaper Co., The.
Gould & Eberhardt, Newark, N. J.
Ryerson, Jos. T., & Sons, Inc., Chicago.
Smith & Mills Co., Cincl.

SHAPING MACHINES—Vertical
Pratt & Whitney Co., Hartford, Conn.

SHEAR BLADES AND KNIVES
Atkins, E. C., & Co., Indianapolis, Ind.
Heppenstall Co., Pittsburgh.
Pittsburgh Forgings Co., Coraopolis, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Alligator
Canton (O.) Fdry. & Mch. Co.
Doeiger & Kirsten, 3105 Chambers St., Mil.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Pgh.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Pgh., Pa.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

SHEARING MACHINES — Automatic Alligator

Doelger & Kirsten, 3105 Chambers St., Mil.

SHEARING MACHINES—Bar

Aetna-Standard Eng. Co., Youngstown, O.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.

SHEARING MACHINES — Beam and Channel

Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES—Billet

Buffalo (N. Y.) Forge Co., 492 B'way.
Morgan Engineering Co., Alliance, O.
Pels, Henry & Co., 90 West St., N. Y. C.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Ptgh.

SHEARING MACHINES — Continuous Automatic

Yoder Co., The, Cleveland.

SHEARING MACHINES — Continuous Sheet & Pack

Streine Tool & Mfg. Co., New Bremen, O.

SHEARING MACHINES—Doubling and Squaring

United Engrg. & Fdry. Co., Ptgh.

SHEARING MACHINES — Metal Slitting

Buffalo (N. Y.) Forge Co., 492 B'way.
Hendley & Whittemore Co., Beloit, Wis.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES — Metal Slitting Gang

Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Plate

Bertsch & Co., Cambridge City, Ind.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg Co., Chicago.
Long & Allstatter Co., Hamilton, O.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Ptgh., Pa.
United Engrg. & Fdry. Co., Ptgh.
Wood, R. D., & Co., Philadelphia.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Rotary for Irregular Cutting

Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Rotary Slitting Gang

Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Sheet and Plate

Dreis & Krump Mfg. Co., Chicago.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner), St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Squaring

Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.
Toledo (O.) Mch. & Tool Co.

SHEET BARS

Andrews Steel Co., Newport, Ky.

SHEET METAL MACHINERY

Adriance Machine Wks., Inc., 82 Richards St., Bklyn, N. Y.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Dreis & Krump Mfg. Co., Chicago.
Excelsior Tool & Mch. Co., East St. Louis, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Kane & Roach, Syracuse, N. Y.
Manning, Maxwell & Moore, Inc., 100 E. 42nd Street, N. Y. C.
Newbold, R. S., & Son Co., Norristown, Pa.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Machine & Tool Co.
V & O Press Co., Hudson, N. Y.
Yoder Co., The, Cleveland.

SHEET METAL WORK

Champion Sheet Metal Co., Inc., Cortland, N. Y.
Kelker Blower Co., Inc., Buffalo, N. Y.

SHEETS—Aluminum

Erdle Perforating Co., Rochester, N. Y.

SHEETS—Auto Body

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.
Youngstown (O.) Sheet & Tube Co.

SHEETS—Black

Bethlehem (Pa.) Steel Company.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sharon (Pa.) Steel Hoop Co.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed

Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Central Iron & Steel Co., Harrisburg, Pa.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sharon (Pa.) Steel Hoop Co.

SHEETS—Box Annealed

Newport (Ky.) Rolling Mill Co.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze

Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

SHEETS—Copper Steel

Newport (Ky.) Rolling Mill Co.

SHEETS—Electrical

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Newport (Ky.) Rolling Mill Co.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

SHEETS—Enameling Stock.

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

SHEETS — Enameling Stock (Genuine Open Hearth Iron)

Newport (Ky.) Rolling Mill Co.

SHEETS—For Drawing and Stamping

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Firth-Sterling Steel Co., McKeesport, Pa.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.
Sharon (Pa.) Steel Hoop Co.
Wheeling (W. Va.) Steel Corp.

SHEETS—Full Finished

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.
Seneca Iron & Steel Co., Buffalo, N. Y.
Youngstown (O.) Sheet & Tube Co.

SHEETS—Galvanized, Flat and Corrugated

Bethlehem (Pa.) Steel Co.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

SHEETS—Locomotive Jacket

Newport (Ky.) Rolling Mill Co.

SHEETS—Manganese Steel

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

SHEETS—Metal Furniture

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Seneca Iron & Steel Co., Buffalo, N. Y.

SHEETS—Pickled

Newport (Ky.) Rolling Mill Co.

SHELLS—Brass and Copper

Bridgeport (Conn.) Brass Co.

SHELVING—Steel

Cleveland (O.) Wire Spring Co.

SHINGLES—Metal

Newport (Ky.) Rolling Mill Co.

SHOVELS—Gasoline

Northwest Engng. Co., Chicago.

SHUTTERS—Steel and Wood Bi-Folding

Kinnear Manufacturing Co., 817-67 Field Ave., Columbus, Ohio.

SKIDS—Lift Truck

Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

SLABS

Andrews Steel Co., Newport, Ky.

SLINGS—Wire Rope

Roebling's, John A., Sons Co., Trenton, N.J.

SLOTTING MACHINES

Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Nazel Engrg. & Mch. Wks., Phila.

SPACING TABLES—Punching & Shearing

Thomas Spacing Mach. Co., Ptgh., Pa.

SPECIAL MACHINERY

Bethlehem (Pa.) Steel Co.
Budd-Ranney Eng. Co., The, Columbus, O.
Bullard Co., The, Bridgeport, Ct.
Clingerman, G. F., Mfg. Co., Bellefontaine, Ohio.
Cook, Asa S., Co., Hartford, Ct.
Cowdrey, C. H., Machine Co., 30 Summer St., Fitchburg, Mass.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hartford (Ct.) Special Mchry. Co.
Jones Mch. Tool Wks., Inc., Phila., Pa.
Langelier Mfg. Co., Providence, R. I.
Littell, F. J., Mch. Co., Chicago.
Manville, E. J., Mach. Co., Waterbury, Ct.
Morgan Engineering Co., Alliance, O.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Treadwell Engineering Co., Easton, Pa.
Yoder Co., The, Cleveland.

SPEED REDUCERS

Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Cleveland (O.) Worm & Gear Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Palmer-Bee Co., Detroit.
Philadelphia (Pa.) Gear Works.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

SPIKES

Ames, W., & Co., Jersey City, N. J.
American Steel & Wire Co., Chicago
Bethlehem (Pa.) Steel Co.
Foster, L. B., Co., Ptgh.

SPRING MAKING MACHINERY

Baird Machine Co., Bridgeport, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS—Car

American Steel & Wire Co., Chicago.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.

SPRINGS—Wire, Coil or Flat

Amer. Spring & Mfg. Corp., Holley, Mich.
American Steel & Wire Co., Chicago.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Cleveland (O.) Wire Spring Co.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., Cleve.
Dunbar Bros. Co., Bristol, Ct.
Fischer, Chas., Spring Co., 243 Kent Ave., Bklyn, N. Y.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Bklyn., N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.
Raymond Mfg. Co., Corry, Pa.
Washburn Wire Co., Phillipsdale, R. I.

SPROCKETS

Boston Gear Works Sales Co., Norfolk Downs, Mass.
Dundore Mfg. Co., Reading, Pa.
Whitney Mfg. Co., Hartford, Ct.

STACKS—Steel

Chicago (Ill.) Bridge & Iron Wks.
Meehan Boiler & Construction Co., Lowellville, Ohio.

STAMPINGS OR DRAWINGS—Metal

Acme Stpg. & Mfg. Co., Pittsburgh.
Akron-Selle Co., Akron, Ohio.
American Pulley Co., Philadelphia.
Amer. Spring & Mfg. Corp., Holley, Mich.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Behringer, E., Sheet Metal Wks., Inc., Newark, N. J.
Bossert Corp., The, Utica, N. Y.
Breese Bros. Co., Cincinnati.
Bridgeport (Conn.) Brass Co.
Burgess-Norton Mfg. Co., Geneva, Ill.
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Cleveland (O.) Hardware Co.
Cook, H. C., Co., Ansonia, Ct.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Crosby Company, The, Buffalo, N. Y.
Cuyahoga Spring Co., Cleveland.
Davis Brake Beam Co., Johnstown, Pa.
Detroit (Mich.) Metal Specialty Corp.
Detroit (Mich.) Stamping Co.
Douglas & Lomason Co., Detroit.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Erdle Perforating Co., Rochester, N. Y.
Fischer, Chas., Spring Co., 243 Kent Ave., Brooklyn, N. Y.
General Mach. & Mfg. Co., Bridgeport, Ct.
Globe Mach. & Stpg. Co., Cleve.
Great Lakes Pressed Steel Corp., Buffalo, N. Y.
Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Huebel Mfg. Co., Inc., Newark, N. J.
Hunter Pressed Steel Co., Lansdale, Pa.
Indiana Pressed Steel Co., Muncie, Ind.
Keystone Friction Hinge Co., Williamsport, Pa.
Konigslow, E., Stpg. & Tool Co., The, Cleveland, Ohio.
Konigslow, Otto, Mfg. Co., Cleve.
Lansing (Mich.) Stpg. Co.
Luna Metal Craft Corp., 38-40 Emerson Pl., Brooklyn, N. Y.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn., N. Y.
Mullins Mfg. Corp., Salem, Ohio.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Patent Specialty Supply Co., Cambridge, N. Y.
Peerless Novelty Co., Grand Haven, Mich.
Penn Jersey Metal Products Corp., Camden, N. J.
Pennsylvania Car Co., Kansas City, Kan.
Plume & Atwood Mfg. Co., Waterbury, Conn.
St. Paul (Minn) Corrugating Co.
Sessions, J. H., & Son, Bristol, Ct.
Seymour (Ct.) Products Co., The.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
Stanley Works, The, New Britain, Ct.
Torrington (Ct.) Co.
Veeder-Root, Inc., Hartford, Ct.
Welker-Hoops Mfg. Co., Middletown, Conn.
Wilkoff, Wm., Inc., Niles, O.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
York (Pa.) Corrugating Co.

STAMPS—Steel Alphabets and Figures

Noble & Westbrook Mfg. Co., Hartford, Ct.
Schwerdtle Stamp Co., Bridgeport, Ct.

STAPLES—Wire

American Steel & Wire Co., Chicago.

STEEL—Alloy

Alan Wood Steel Co., Conshohocken, Pa.
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Heller Bros. Co., Newark, N. J.
Heppenstall Co., Pittsburgh.
Jessop Steel Co., Washington, Pa.
Kinite Corp., The, Milwaukee.
Latrobe (Pa.) Electric Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, Ohio.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Alloy, Cold Drawn

Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

STEEL—Bright Finished

Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Ptgh.

STEEL—Carbon

Andrews Steel Co., The, Newport, Ky.
Carnegie Steel Co., Pittsburgh.
Firth-Sterling Steel Co., McKeesport, Pa.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Latrobe (Pa.) Electric Steel Co.

STEEL—Carbon Vanadium

Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome

Andrews Steel Co., The, Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Manganese

Latrobe (Pa.) Electric Steel Co.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Chrome Nickel

Andrews Steel Co., Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

Harrisburg (Pa.) Pipe & Pipe Bending Co.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Vanadium

Andrews Steel Co., Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Latrobe (Pa.) Electric Steel Co.

STEEL—Cobalt

Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn

American Steel & Wire Co., Chicago.
Bethlehem (Pa.) Steel Co.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Latrobe (Pa.) Electric Steel Co.
Moltrup Steel Prods. Co., Beaver Falls, Pa.
Rathbone, A. B. & J., Palmer, Mass.
Wetherell Bros. Co., Cambridge, 39, Mass.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Ptgh.

STEEL—Cold Rolled Strips

Acme Steel Co., Chicago.
American Steel & Wire Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Athenia Steel Co., 135 William St., N. Y.
Cold Metal Process Co., Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Union Trust Bldg., Ptgh.
Washburn Wire Co., Inc., Phillipsdale, R. I.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Ptgh.
Wetherell Bros. Co., Cambridge, 39, Mass.
Worcester (Mass.) Pressed Steel Co.

STEEL—Crucible

Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery

Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Die

Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Disston, Henry, & Sons, Inc., Phila.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., Pittsburgh.
Kinite Corp., The, Milwaukee.
Latrobe (Pa.) Electric Steel Co.

STEEL—Drill

Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Electric

Bethlehem (Pa.) Steel Co.
Disston, Henry, & Sons, Inc., Phila.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., Canton, O.

STEEL—High Speed

Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Co.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Elec. Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Simonds Saw & Steel Co., Lockport, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Hot Rolled Strips

Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Bristol, Ct.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Laclede Steel Co., St. Louis, Mo.
Latrobe (Pa.) Elec. Steel Co.
Sharon (Pa.) Steel Hoop Co.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Union Trust Bldg., Ptgh.
West Leechburg Steel Co., Ptgh.

STEEL—Magnet

Latrobe (Pa.) Elec. Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Manganese

Frog, Switch & Mfg. Co., The, Carlisle, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

STEEL—Manganese Rolled or Forged

Manganese Steel Forge Co., Phila.

STEEL—Nickel

Andrews Steel Co., Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.

STEEL—Open Hearth

Andrews Steel Co., The, Newport, Ky.
Driver-Harris Co., Harrison, N. J.
Sharon (Pa.) Steel Hoop Co.
Timken Roller Bearing Co., Canton, O.

STEEL—Rustless

Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Screw

American Steel & Wire Co., Chicago.
Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wyckoff Drawn Steel Co., Ptgh.

STEEL—Special Analysis

Andrews Steel Co., The, Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Kinite Corp., The, Milwaukee.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., Canton, O.
West Leechburg Steel Co., Ptgh.

STEEL—Spring

Athenia Steel Co., 135 William St., N. Y.
Barnes, Wallace, Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Co.

Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, Ohio.

STEEL—Stainless

Bethlehem (Pa.) Steel Co.
Disston, Henry & Sons, Inc., Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Tool

Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Co.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Phila.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Milne, A., & Co., 745 Washington St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Simonds Saw & Steel Co., Lockport, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wetherell Bros. Co., Cambridge 39, Mass.

STEEL—Tool, Special Shapes

Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Vanadium

Andrews Steel Co., Newport, Ky.
Central Alloy Steel Div., Republic Steel Corp., Youngstown, Ohio.
Latrobe (Pa.) Elec. Steel Co.

STEEL PLANTS AND ROLLING MILLS

McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

STEEL PLATE CONSTRUCTION

Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.
Lancaster (Pa.) Iron Works, Inc.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Petroleum Iron Works Co., Sharon, Pa.
Steel Plate Products Co., Pottstown, Pa.

STEEL ROLLS

Heppenstall Co., Pittsburgh.

STEPS—Ladder & Stair, Safety

Blaw-Knox Co., Pittsburgh.

STEPS—Safety

Hendrick Mfg. Co., Carbondale, Pa.
Irving Iron Wks. Co., L. I. City, N. Y.

STOCKS AND DIES

Jones & Lamson Mach. Co., Springfield, Vt.
Saunders', D., Sons, Yonkers, N. Y.

STOKERS

Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

STOOLS—Steel

Angle Steel Stool Co., Plainwell, Mich.
Vitek Mfg. Co., Omaha, Neb.

STOOLS—Steel, Adjustable

Vitek Mfg. Co., Omaha, Neb.

STOPPERS—Open-Hearth, Bessemer or Electric Furnace

McCullough-Dalzell Crucible Co., Ptgh.
Ross-Tacony Crucible Co., Phila.

STOVES—Hot Blast

Brassert, H. A., & Co., Chicago.

STRAIGHTENING MACHINES

Aetna-Standard Eng. Co., Youngstown, O.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Thomas Spacing Mch. Co., Ptgh., Pa.
Whitney Metal Tool Co., Rockford, Ill.

STRAIGHTENING MACHINES—Wire

Lewis Mch. Co., The, Cleveland, Ohio.
Shuster, F. B., Co., New Haven, Ct.

STRUCTURAL IRON AND STEEL WORK

American Institute of Steel Construction, Inc., 200 Madison Ave., N. Y. C.
Austin Co., The, Cleveland.
Belmont Iron Wks., Phila.
Bethlehem (Pa.) Steel Co.
Morgan Engng. Co., Alliance, O.
Palmer-Bee Co., Detroit.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.
Virginia Bridge & Iron Co., Roanoke, Va.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

SULPHATE OF IRON

American Steel & Wire Co., Chicago.

SUPERHEATERS

Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES

Etna Machine Co., The, Toledo.
Langelier Mfg. Co., Providence, R. I.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, N. Y.
Torrington (Ct.) Co.

SWITCHES—Electric

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TACHOMETERS—Angular and Linear Velocity

Barbour-Stockwell Co., Cambridge, Mass.

TACKS

American Steel & Wire Co., Chicago.

TANKS—Compressed Air, Gas, Oil and Water

Air-Tight Steel Tank Co., Ptgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Maxweld Corp., 140-13th St., Brooklyn, N. Y.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Ptgh.
Westinghouse Traction Brake Co., Wilmerding, Pa.

TANKS—Elevated Steel

Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.

TANKS—Elevated Wood

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.

TANKS—Gasoline & Oil

Chicago (Ill.) Bridge & Iron Wks.

TANKS—Iron and Steel

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Chicago (Ill.) Bridge & Iron Wks.
Janney, Joseph A., Jr., Phila.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Lancaster (Pa.) Iron Works, Inc.
Maxweld Corp., 140-13th St., Brooklyn, N. Y.
Scaife, Wm. B., & Sons Co., Ptgh.
Steel Plate Products Co., Pottstown, Pa.

TANKS—Lead Lined

Gross Lead Burning & Coating Corp., Cleveland.

TANKS—Pickling

Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Rubber Lined

Hauser-Stander Tank Co., Cincinnati.

TANKS—Seamless Steel

National Tube Co., Pittsburgh.

TANKS—Water

Hauser-Stander Tank Co., Cincinnati.

TANKS—Welded

Air-Tight Steel Tank Co., Ptgh.
National Tube Co., Pittsburgh.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Wood

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TAPER PINS

Buffalo (N. Y.) Mch. Key Co.

TAPPING MACHINES

Baker Bros., Inc., Toledo.
Barnes Drill Co., Inc., Rockford, Ill.
Defiance (O.) Machine Works
Langelier Mfg. Co., Providence, R. I.
Whitney Metal Tool Co., Rockford, Ill.

TAPPING MACHINES—Nuts

National Mchry. Co., Tiffin, Ohio.

TAPS—Collapsing

Geometric Tool Co., New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

TAPS AND DIES

Brubaker, W. L., & Bros., Co., 50 Church St., N. Y. C.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.
Pipe Mchry. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

TEES—See Angles, Beams, Channels and Tees

TELEPHONES—Interior

Screw Machine Products Corp., Prov., R. I.

TERNE PLATES

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

TESTING MACHINES—Materials

Southwark Fdry. & Mch. Co., Phila.

THREAD CUTTING TOOLS—See Dies, Taps, Screw Plates, etc.

THREAD ROLLING MACHINES

Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

THREADING MACHINES

Geometric Tool Co., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

THREADING MACHINES—Automatic

Landis Mch. Co., Inc., Waynesboro, Pa.

TIE PLATES

Joliet (Ill.) Wrought Washer Co.

TIES—Bale

American Steel & Wire Co., Chicago.

TIES—Creosoted

Century Wood Preserving Co., Ptgh.

TIES—Metal

Bethlehem (Pa.) Steel Co.

TILE—Cement Roofing

American Cement Tile Mfg. Co., 803 Oliver Bldg., Ptgh.

TIN PLATE

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

TIN PLATE MACHINERY

Aetna-Standard Eng. Co., Youngstown, O.

TINNERS' TOOLS AND MACHINES

Niagara Mch. & Tool Wks., Buffalo, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.

TONGS—Chain Pipe

Williams, J. H., & Co., Buffalo, N. Y.

TOOL BITS

Apex Tool Co., Inc., Bridgeport, Conn.
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

TOOL HOLDERS

Apex Tool Co., Inc., Bridgeport, Conn.
Armstrong Bros. Tool Co., Chicago.
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.
Williams, J. H., & Co., Buffalo, N. Y.

TOOLS, JIGS, FIXTURES, ETC.

Pratt & Whitney Co., Hartford, Conn.

TOOLS—Lathe

Armstrong Bros. Tool Co., Chicago.
Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

TOOLS—Metal Cutting

Haynes Stellite Co., 30 E. 42nd St., N. Y. C.

TOOLS—Steam and Gas Fitters

Saunders', D., Sons, Yonkers, N. Y.

TOOLS—Tungsten Carbide

Firth-Sterling Steel Co., McKeesport, Pa.

TORCHES—Blow

Anthony Co., L. I. C., N. Y.
Hauck Mfg. Co., 128 10th St., Bklyn, N. Y.

TORCHES—Brazing, Cutting & Welding

Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

TOWERS—Steel

Blaw-Knox Co., Pittsburgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.

TOWERS—Transmission

Blaw-Knox Co., Pittsburgh.

TOWERS—Water—See Tanks—Elevated Steel and Elevated Wood

TRACK—Industrial

Bethlehem (Pa.) Steel Co.

TRACK—Monorail

American Monorail Co., The, Cleveland.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

(ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231)

TRACTORS AND TRAILERS—See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial—See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
Armington Engineering Co., Euclid, O.
Cleveland Electric Tramrail, Wickliffe, O.
Reading (Pa.) Chain & Block Corp.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TRAMWAYS—Wire Rope
American Steel & Wire Co., Chicago.
Broderick & Bascom Rope Co., St. Louis.
Leschen, A., & Sons Rope Co., St. Louis.

TRAPS—Steam and Radiator
Johns-Manville Corp., 292 Madison Ave., New York City.
Strong, Carlisle & Hammond Co., Cleve.

TROLLEYS
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 So. Jefferson St., Mendota, Ill.
Hanna Engineering Works, Chicago.
Palmer-Bee Co., Detroit.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TROLLEYS—Monorail
American MonoRail Co., The, Cleveland.

TRUCKS—Dump (Power)
Crescent Truck Co., Lebanon, Pa.

TRUCKS—Elevating (Power)
Automatic Transportation Co., Inc., Buffalo, N. Y.
Crescent Truck Co., Lebanon, Pa.
Ready-Power Co., Detroit, Mich.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.

TRUCKS—Lift (Hand and Foot)
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

TRUCKS—Steel Shop
American Pulley Co., Philadelphia

TRUCKS—Two Wheel Hand
American Pulley Co., Philadelphia
Colson Co., The, Elyria, Ohio.

TRUCKS, TRACTORS AND TRAILERS—Industrial
Atlas Car & Mfg. Co., Cleve.
Automatic Transportation Co., Inc., Buffalo, N. Y.
Chase Fdry. & Mfg. Co., Columbus, O.
Colson Co., The, Elyria, Ohio.
Crescent Truck Co., Lebanon, Pa.
Ready-Power Co., Detroit, Mich.
Sterling Wheelbarrow Co., Milwaukee.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.

TUBE FORMING MACHINES
Yoder Co., The, Cleveland.

TUBE MILL MACHINERY
Aetna-Standard Eng. Co., Youngstown, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdry. Co., Ptgh.

TUBES—Boiler
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tyler Tube & Pipe Co., The, Washington, Pa.
Wanderman, H. L., Co., The, 1440 Broadway, New York City.

TUBES—Boiler, Charcoal Iron
Bethlehem (Pa.) Steel Co.
Keating, E. F., Co., 452 Water St., N. Y.
Tyler Tube & Pipe Co., Washington, Pa.

TUBES—Nickel Silver
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Aluminum, Seamless
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Brass, Bronze, Copper or Nickel Silver
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Wolverine Tube Co., Detroit.

TUBING—Open Seam
Michigan Steel Tube Prods. Co., Detroit.

TUBING—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

TUBING—Seamless Steel
Cleveland (O.) Tool & Supply Co.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Wanderman, H. L., Co., The, 1440 Broadway, New York City.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Youngstown (O.) Sheet & Tube Co.

TUBING—Square and Rectangular
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Welded Steel
Michigan Steel Tube Prods. Co., Detroit.
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Tyler Tube & Pipe Co., The, Washington, Pa.
Wanderman, H. L., Co., The, 1440 Broadway, New York City.
Youngstown (O.) Sheet & Tube Co.

TUBING MACHINERY—Brazed
Etna Machine Co., The, Toledo

TUBULAR PRODUCTS
Cleveland (O.) Tool & Supply Co.
Michigan Steel Tube Products Co., Detroit.
Service Steel Co., Detroit.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Ct.
Globe Mach. & Stpg. Co., Cleveland.
Ransohoff, N., Inc., Cinn., Ohio.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Sly, W. W., Mfg. Co., Cleveland, O.

TURBINES
De Laval Steam Turbine Co., Trenton, N. J.

TURNTABLES
Canton (O.) Fdry. & Mch. Co.

TWIST DRILLS
Cleveland (O.) Twist Drill Co.
Union Twist Drill Co., Athol, Mass.

TYPE—Steel
Noble & Westbrook Mfg. Co., Hartford, Ct.

UNIONS
Dart, E. M., Mfg. Co., Prov., R. I.

VALVES—Air Operating
Galland-Henning Mfg. Co., Milwaukee.
Westinghouse Traction Brake Co., Wilmerding, Pa.

VALVES—Gas and Air Reversing
Swindell-Dressler Corp., Box 1753, Ptgh.

VALVES—Gas, Water and Steam
Jarecki Mfg. Co., Erie, Pa.
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Anker Engng. Co., Phila.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Watson-Stillman Co., The, 71 West St., N. Y. C.
Wood, R. D., & Co., Philadelphia.

VALVES—(Pressure Seated) Pneumatic
Cleveland (O.) Pneumatic Tool Co., The

VISES
Eagle Anvil Works, Trenton, N. J.
Jarecki Mfg. Co., Erie, Pa.

VISES—Machine, Compensating
Avey Drilling Mch. Co., Cincinnati, O.

WALKWAYS—Open Steel
Irving Iron Wks. Co., L. I. City, N. Y.

WASHERS—Bevel
Nicetown Plate Washer Co., Inc., Phila.

WASHERS—Iron or Steel
Bethlehem (Pa.) Steel Co.
Griffin Mfg. Co., Erie, Pa.
Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.
Joliet (Ill.) Wrought Washer Co.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Nicetown Plate Washer Co., Inc., Phila.
Sessions, J. H., & Son, Bristol, Conn.
Shakeproof Lock Washer Co., Chicago.
Smith, Thomas, Co., 286 Grove St. Worcester, Mass.
Wrought Washer Mfg. Co., Milwaukee.

WASHERS—Leather
Graton & Knight Co., Worcester, Mass.

WASHERS—Lock
Shakeproof Lock Washer Co., Chicago.

WASHERS—Special
Shakeproof Lock Washer Co., Chicago.

WASHERS—Spring Steel
Dunbar Bros. Co., Bristol, Ct.

WASHERS—Tempered
Barnes, Wallace, Co., The, Bristol, Ct.

WASHING MACHINES—For Metal Parts
Detroit (Mich.), Sheet Metal Wks.
Meaker Co., The, Chicago.
Ransohoff, N., Inc., Cinn., Ohio.

WATER-COOLED EQUIPMENT FOR OPEN-HEARTH FURNACES
Blaw-Knox Co., Pittsburgh.

WATER SOFTENERS AND PURIFIERS
Scaife, Wm. B., & Sons Co., Ptgh.

WELDING—Electric
Agnew Elec. Welder Co., Milford, Mich.
Blaw-Knox Co., Pittsburgh
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING—Forge & Hammer
Blaw-Knox Co., Pittsburgh

WELDING—Oxy-Acetylene
Blaw-Knox Co., Pittsburgh
Harris Calorific Co., Cleveland.
Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago, Ill.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Harris Calorific Co., Cleveland.
Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago, Ill.
International Oxygen Co., Newark, N. J.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

WELDING MACHINES—Butt
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Swift Electric Welder Co., Blvd Temple Bldg., West Grand Blvd. at 12th St., Detroit.
Taylor-Winfield Corp., The, Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—(Electric Arc), Second-Hand
Goodman Elec. Mchry. Co., Newark, N. J.

WELDING MACHINES—Seam
Federal Mch. & Welder Co., Warren, O.
Taylor-Winfield Corp., The, Warren, O.

WELDING MACHINES—Spot
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Swift Electric Welder Co., Blvd Temple Bldg., West Grand Blvd. at 12th St., Detroit.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—(Spot), Second Hand
Taylor-Hall Welding Corp., 5 May St., Worcester, Mass.

WHEELBARROWS—Foundry
Sterling Wheelbarrow Co., Milwaukee.

WHEELS—Caster and Truck
Colson Co., The, Elyria, Ohio.

WHEELS—Rolled Steel
Bethlehem (Pa.) Steel Co.
Carnegie Steel Co., Pittsburgh.

WIRE—Barb
American Steel & Wire Co., Chicago.
Bethlehem (Pa.) Steel Co.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

WIRE—Broom
American Steel & Wire Co., Chicago.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co., Chicago.
Hartshorn, Stewart, Co., 250 Fifth Ave., N. Y. C.
Page Steel & Wire Co., Bridgeport, Ct.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., Inc., Phillipsdale, R. I.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.

WIRE—Insulated
American Steel & Wire Co., Chicago.

WIRE—Mattress
American Steel & Wire Co., Chicago.

WIRE—Netting
American Steel & Wire Co., Chicago.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
American Steel & Wire Co., Chicago.
Washburn Wire Co., Phillipsdale, R. I.
Webb Wire Works, New Brunswick, N. J.

WIRE—Rubber Covered
American Steel & Wire Co., Chicago.
Hazard Wire Rope Co., Wilkes-Barre, Pa.

WIRE—Special, Drawn Shapes
Rathbone, A. B. & J., Palmer Mass.

WIRE—Spoke and Crimping
American Steel & Wire Co., Chicago.
Prentiss, Geo. W., & Co., Holyoke, Mass.

WIRE—Spring Steel
American Steel & Wire Co., Chicago.
Barnes, Wallace Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Co.
Hartshorn, Stewart, Co., 250 5th Ave., N. Y. C.
Johnson Steel & Wire Co., Inc., Worcester, Mass.

WIRE—Steel
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Wheeling (W. Va.) Steel Corp.

WIRE—Telephone and Telegraph
American Steel & Wire Co., Chicago.

WIRE—Trolley
American Steel & Wire Co., Chicago.

WIRE—Welding
American Steel & Wire Co., Chicago.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., Chicago.

WIRE CLOTH
Buffalo (N. Y.) Wire Works Co., Inc.
Wickwire Bros., Cortland, N. Y.

WIRE COILING AND SPIRALLING MACHINERY
Bleeper & Hartley, Inc., Worcester, Mass.

WIRE DRAWING MACHINERY
Bleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machry. Co., Cuyahoga Falls, O.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

WIRE FORMING
American Spring & Mfg. Corp., Holley, Mich.
American Steel & Wire Co., Chicago.
Buffalo (N. Y.) Wire Works Co., Inc.
Cleveland (O.) Wire Spring Co.
Cuyahoga Spring Co., Cleveland
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
Hindley Mfg. Co., Valley Falls, R. I.
Wickwire Bros., Cortland, N. Y.

WIRE FORMING MACHINERY
Baird Machine Co., Bridgeport, Ct.
Manville, E. J., Mach. Co., Waterbury, Ct.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Bleeper & Hartley, Inc., Worcester, Mass.

WIRE MILL MACHINERY AND EQUIPMENT
Bluster, F. B., Co., New Haven, Ct.
Bleeper & Hartley, Inc., Worcester, Mass.
Vaughn Mchry. Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY
National Mchry. Co., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Bleeper & Hartley, Inc., Worcester, Mass.

WIRE ROPE
American Steel & Wire Co., Chicago.
Broderick & Bascom Rope Co., St. Louis.
Hazard Wire Rope Co., Wilkes-Barre, Pa.
Leschen, A., & Sons Rope Co., St. Louis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE ROPE FITTINGS
American Steel & Wire Co., Chicago
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Franklin Mfg. Co., New Haven, Ct.
Lewis Mch. Co., The, Cleveland, Ohio.
Nilson, A. H., Mch. Co., Bridgeport, Ct.
Bluster, F. B., Co., New Haven, Ct.

WIRE STRANDING AND CLOSING MACHINES
Bleeper & Hartley, Inc., Worcester, Mass.

WOOD BLOCK FLOORING—See Flooring—Creosoted Wood

WOOD-WORKING MACHINERY
Osborne & Sexton Masnry. Co., Columbus, O.
Tannewitz Works, The, Grand Rapids, Mich.

WORK EJECTORS—Air Operated
Logansport (Ind.) Mch. Co.

WORK STANDS FOR DIE BLOCKS
Tomkins-Johnson Co., Jackson, Mich.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Cleveland (O.) Punch & Shear Wks. Co.
Drop Forging Co. of N. Y., Jersey City.
Indianapolis (Ind.) Drop Forging Co.
Williams, J. H., & Co., Buffalo, N. Y.

ZINC—Cold Rolled Strips
Platt Bros. & Co., The, Waterbury, Ct.

ZINC—Slab (Spelter)
Erdle Perforating Co., Rochester, N. Y.
United Metals Selling Co., 25 B'way, N.Y.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 229-231

Advertisers Index

A

Abbott Ball Co.....105
Abendroth & Root Mfg. Co....142
Abrasive Mch. Tool Co..... 60
Acme Machine Tool Co..... 58
Acme Machinery Co.....123
Acme Stpg. & Mfg. Co.....214
Acme Steel Co.....141
Adams Co., The.....110
Adriance Mach. Works, Inc.... 73
Aetna-Standard Eng. Co..... 8
Agnew Electric Welder Co..... 86
Air Reduction Sales Co..... 83
Air-Tight Steel Tank Co.....124
Akron Gear & Engr. Co.....118
Akron-Selle Co., The.....160
Alan Wood Steel Co.....145, 202
Albert & Davidson Pipe Corp...212
Albert Pipe Supply Co., Inc....212
Allen, Edgar, Steel Co., Inc....139
Allen, John F., Co..... 82
Allen Mfg. Co., The.....170
Alliance Mach. Co., The..... 92
Allis-Chalmers Mfg. Co.....194
American Broach & Mach. Co.... 58
American Cement Tile Mfg. Co..128
American Chemical Paint Co.....186
American Crane Co., Inc..... 93
American Crusher & Machinery Corp. 204
American Cyanamid Co.....187
American Electric Furnace Co...190
American Engineering Co..... 96
American Fluid Motors Co..... 78
American Gas Association.....189
American Gas Furnace Co.....190
American Institute of Steel Construction, Inc. 17
American Manganese Steel Co...156
American MonoRail Co., The... 94
American Pipe Bending Mch. Co. 84
American Pressed Steel Co.....201
American Pulley Co.....110
American Pulverizer Co.....204
American Spring & Mfg. Corp...185
American Steel Foundries..154, 156
American Steel & Wire Co..... 12
American-Terry-Derrick Co. 99
American Tool Works Co..... 56
American Welding & Mfg. Co...151
Ames, W., & Co.....176
Andrews Steel Co.....128
Angle Steel Stool Co.....204
Anker Engineering Co.....194
Anthony Co. 186
Apex Tool Co., Inc..... 69
Arcade Mfg. Co.....102
Archer & Baldwin, Inc.....210
Armel, James P.....211
Armington Engrg. Co. 94
Armstrong-Blum Mfg. Co..... 63
Armstrong Bros. Tool Co..... 54
Athenia Steel Co., The.....139
Atkins, E. C., & Co..... 25
Atlantic Steel & Pipe Corp.....212
Atlas Brass Fdry. Co.....215
Atlas Car & Mfg. Co..... 90
Atlas Drop Forge Co.....154
Atlas Steel Casting Co.....156, 210
Auburn Ball Bearing Co.....170
Austin Co., The 126
Automatic Transportation Co., Inc. 100
Avey Drilling Mch. Co..... 57

B

Babcock & Wilcox Co., The....195
Baird Machine Co..... 51
Baker, J. E., Co.....148
Baker Bros., Inc..... 57
Bantam Ball Bearing Co.....170
Barber-Colman Co. 63
Barbour-Stockwell Co. 122
Bardons & Oliver 63
Barnes Drill Co., Inc..... 56
Barnes-Gibson-Raymond, Inc..... 20
Barnes, Wallace, Co., The..... 20
Barnes, W. F. & John, Co..... 57
Bartlett, C. O., & Snow Co..... 11
Bascom & Co. 215
Beardsley & Piper Co.....102
Beatty Mch. & Mfg. Co..... 79
Bedford Fdry. & Mch. Co..... 92
Behringer, E., Sheet Metal Wks., Inc. 214
Bell, David, Co., Inc., The.....174
Belmont Iron Works.....126
Belyea Co., Inc. 210
Bertsch & Co. 110
Best, W. N., Corp.....188
Bethlehem Steel Co..... 28
Bignall & Keeler Mach. Works.. 62
Birdsboro Steel Fdry. & Mch. Co. 76
Bixby, R. W., Inc.....217
Black & Decker Mfg. Co., The.. 61
Blanchard Mach. Co., The..... 60
Blaw-Knox Co. 108
Bliss, E. W., Co.....107
Bliss & Laughlin, Inc.....128
Board of Water Supply.....216
Booth Felt Co., Inc., The.....201
Bossert Corp. 164
Boston Gear Works Sales Co.....112
Box Crane & Hoist Corp..... 95
Boyle, John, Jr.....216
Bradlee & Co., Inc.....110
Breese Bros. Co. 162
Brassert, H. A., & Co.....126
Bridgeport Brass Co.....162
Bridgeport Safety Emery Wheel Co., Inc., The..... 61
Bristol Co., The 37
Britesun, Inc. 138
Broderick & Bascom Rope Co...182
Brosius, Edgar E., Inc.....188
Brown Bag Filling Mach. Co...214
Brown & Sharpe Mfg. Co..... 59
Brubaker, W. L., & Bros. Co... 66
Bruce Products Corp.....186
Buckeye Brass & Mfg. Co.....170
Budd-Ranney Engng. Co., The.. 56
Buffalo Bolt Co.....176
Buffalo Bronze Die Cast Corp. 167, 215
Buffalo Forge Co.....203
Buffalo Mch. Key Co.....180
Buffalo Scale Co. 92
Buffalo Wire Wks. Co., Inc.....182
Bullard Co., The..... 43
Burgess-Norton Mfg. Co.....214
Bury Compressor Co.....196
Business Opportunities Section..216

C

Cadman, A. W., Mfg. Co.....215
Calder, Geo. H..... 64
Caldwell, W. E., Co.....109
Calumet Electric Casteel Co.....157
Cann & Saul Steel Co.....151
Canton Forge & Axle Co.....152
Canton Fdry. & Mch. Co..... 78
Cape May Sand Co.....102
Carnegie Steel Co.....137
Cattie Bros. Corp.....215
Cattie, Joseph P., & Bros.....215
Cavagnaro, John J.....213
Central Alloy Steel Div. Republic Steel Corp.....128
Central Iron & Steel Co.....201
Century Electric Co.....120
Century Wood Preserving Co...202
Chambersburg Engng. Co.....118
Champion Blower & Forge Co...188
Champion Sheet Metal Co., Inc.162
Chase Fdry. & Mfg. Co..... 99
Chateaugay Ore & Iron Co.....145
Chicago Bridge & Iron Wks....122
Chicago Perforating Co.....166
Chicago Pneumatic Tool Co..... 70
Cincinnati Bickford Tool Co..... 44
Cincinnati Electrical Tool Co., The 60
Cincinnati Lathe & Tool Co..... 56
Cincinnati Planer Co., The..... 59
Cincinnati Shaper Co..... 71
Cincinnati Steel Castings Co.....157
Clapp, E. D., Mfg. Co., The....154
Clark Bros. Bolt Co.....178
Clark Controller Co.....110
Clearing House Section.....206-212
Cleveland Cap Screw Co.....173
Cleveland-Cliffs Iron Co.....147
Cleveland Crane & Engng. Co... 30
Cleveland Electric Tramrail..... 31
Cleveland Hardware Co.....152
Cleveland Planer Co..... 60
Cleveland Pneumatic Tool Co., The 71
Cleveland Punch & Shear Wks. Co. 71
Cleveland Quarries Co..... 60
Cleveland Tool & Supply Co....142
Cleveland Twist Drill Co..... 63
Cleveland Wire Spring Co.....185
Cleveland Worm & Gear Co.....233
Clifton Mchry. Co.....210
Clingerman, G. F., Mfg. Co.....213
Cochrane-Bly Co. 63
Cohen, Louis, & Son.....212
Cold Metal Process Co., The....142
Cole, R. D., Mfg. Co.....122
Colebrookdale Iron Co.....215
Colson Co., The 99
Columbia Tool Steel Co.....139
Commercial Steel Casting Co.....155
Commonwealth Brass Corp.....201
Conco Crane & Engng. Wks. Div. of H. D. Conkey & Co.. 93
Cone Automatic Mach. Co., Inc. 57
Connecticut Fdry. Co., The.....215
Consolidated Mach. Tool Corp. of America 49
Continental Felt Co.....201
Continental Iron & Steel Co.....212
Contract Work Section.....213-215
Cook, Asa S., Co..... 86
Cook, H. C., Co.....214
Cook Spring Div. of Barnes-Gibson-Raymond, Inc. 20
Corbin Screw Corp.....174
Cowdrey, C. H., Mach. Co.....213
Crawbuck, John D., Co.....211
Crescent Truck Co.....102
Criswell, James, Co.....126
Crosby Co., The..... 15
Cross Engineering Co.....166
Crucible Steel Casting Co., Ohio.157
Crucible Steel Castings Co., Pa..157
Cumberland Steel Co.....138
Curtis & Curtis Co..... 61
Cutler-Hammer, Inc. 121
Cuyahoga Spring Co.....184

D

Dake Engine Co. 194
Dart, E. M., Mfg. Co.....196
Darwin & Milner, Inc.....138
Davis Brake Beam Co.....214
Defiance Mch. Wks..... 59
De Laval Steam Turbine Co.....194
Detroit Electric Furnace Co.....188
Detroit Hoist & Mch. Co..... 99
Detroit Metal Specialty Corp.....164
Detroit Sheet Metal Works.....190
Detroit Stamping Co.....160
Diamond Mfg. Co.....164
Dickinson, Thos. L..... 69
Dings Magnetic Separator Co...104
Disston, Henry, & Sons, Inc.... 64
Divine Bros. Co..... 64
Doelger & Kirsten..... 72
Donahue Steel Prod. Co....210, 213
Dony, D. E.....209
Douglas & Lomason Co.....162
Dreis & Krump Mfg. Co..... 82
Driver-Harris Co. 138
Drop Forging Co. of New York.152
Drying Systems, Inc.....190
Duff Patents Co., Inc.....128
Duluth Iron & Metal Co.....212
Dunbar Bros. Co..... 19
Dundore Mfg. Co.....110
Duquesne Steel Fdry. Co.....156

E

Eagle Anvil Wks.....204
Earle Gear & Mach. Co.....114
Eastern Machine Screw Corp... 65
Eastern Mchry. Co.....208
Eastern Rolling Mill Co., The..139
Eastern Tool & Mfg. Co.....182
Eastern Tool & Stpg. Co., Inc...214
Easton Car & Construction Co... 99
Economy Engng. Co., The..... 61
Edge Hill Silica Rock Co.....147
Edgewater Steel Co.....152
Electric Controller & Mfg. Co... 99
Electric Furnace Co.....188
Elmes, Chas. F., Engng. Wks... 72
Employment Exchange 216-217
Erdle Perforating Co.....165
Erie Bronze Co.....164
Erie Forge Co.....156
Erie Steel Construction Co., The. 39
Espen-Lucas Mach. Works, The 63
Essley, E. L., Mchry. Co.....207
Etna Machine Co., The..... 90
Euclid Crane & Hoist Co., The.. 92
Evans Friction Cone Co.....109
Excelsior Tool & Mch. Co..... 82
Eyster, Weiser Co.....215

F

Fabricated Steel Prods. Co.....213
Fafnir Bearing Co.....171-172
Falk Corp. 115-116
Federal Mch. & Welder Co..... 85
Felters Co., Inc., The.....201
Ferguson Gear Co.....110
Ferracute Machine Co..... 71
Ferry Cap & Set Screw Co.....177
Firth-Sterling Steel Co..... 21
Fischer, Charles, Spring Co.....186
Fisher & Norris.....204
Flagg, Stanley G., & Co., Inc..157
Foote Bros. Gear & Mch. Co....117
Foster, L. B., Co..... 23
Frank, M. K.....212
Franklin Mch. Co.....213
Franklin Mfg. Co..... 86
Fredericksen Co. 169

Advertisers Index

French Oil Mill Mchry. Co..... 72
Frog Switch & Mfg. Co., The..157

G

Galland-Henning Mfg. Co.....197
Gardner Machine Co..... 60
Gary Screw & Bolt Co..... 18
Gears & Forgings, Inc.....119
Gehnrich Oven Co., Inc.....190
General Machine Works.....213
General Mch. & Mfg. Co.....214
General Mchry. Corp.....207
General Refractories Co.....148
Geometric Tool Co., The..... 64
Gibson, Wm. D., Co..... 20
Gifford-Wood Co. 215
Gleason Wks. 16
Globe Mch. & Stpg. Co.....104
Globe Wire Co.....139
Goodman Electric Mchry. Co...211
Gould & Eberhardt..... 60
Grant Gear Works.....110
Graton & Knight Co.....111
Gray, G. A., Co..... 59
Great Lakes Pressed Steel Corp.214
Greenpoint Iron & Pipe Co., Inc.212
Griffin Mfg. Co.....142
Gross Lead Burning & Coating Corp. 122

H

Hagan, George J., Co.....190
Hager, C., & Sons Hinge Mfg. Co. 162
Hammond Mchry. Builders, Inc.. 60
Hanna Engr. Works.....82, 99
Hanna Furnace Corp., The.....146
Harbison-Walker Refractories Co. 149-150
Hardie Tynes Mfg. Co.....215
Harnischfeger Corp. 92, 94
Harrington & King Perforating Co. 165
Harris Calorific Co..... 84
Harrisburg Pipe & Pipe Bending Co. 14
Harrison, H. H., Inc.....217
Harsch, John, Bronze & Fdry. Co., The 156
Hart, R. E., Mfg. Co.....193
Hartford Machine Screw Co....214
Hartford Special Mchry. Co., The 110, 213
Hartshorn, Stewart, Co.....182
Hauck Mfg. Co. 186
Hauser-Stander Tank Co.....124
Haynes Stellite Co..... 67
Hayward Co., The 91
Hazard Wire Rope Co.....183
Heller Bros. Co.....138
Helwig Mfg. Co..... 69
Hendley & Whittemore Co..... 78
Hendrick Mfg. Co.....166
Henry Forge & Tool, Inc.....154
Heppenstall Co. 151
Herman Pneumatic Mch. Co...102
Hevi Duty Electric Co.....188
Highway Truck Parts Co.....209
Hill, Clarke & Co., of Chicago..206
Hillman Coal & Coke Co.....147
Hindley Gear Co.....118
Hindley Mfg. Co.....182
Hoggson & Pettis Mfg. Co., The.202
Holcroft & Co. 188
Horsburgh & Scott Co.....113
Hoskins Mfg. Co.....190
Hubbard, M. D., Spring Co.....185
Huebel Mfg. Co., Inc.....214
Hunter Pressed Steel Co.....186
Hunter Saw & Mch. Co..... 64
Hurlbut Rogers Mchry. Co..... 61
Hyde Park Fdry. & Mch. Co...105
Hydraulic Press Mfg. Co..... 77
Hyman, Joseph, & Sons.....208

I

Ideal Mchry. Co.....207
Illinois Steel Co.....132, 202
Imperial Brass Mfg. Co., The.. 86
Independent Pneumatic Tool Co. 50, 71
Indiana Pressed Steel Co.....162
Indianapolis Drop Forging Co...152
Industrial Silica Corp.....102
Industrial Steel Casting Co.....157
Ingersoll-Rand Co. 194
International Oxygen Co..... 84
Irving Iron Wks. Co..... 35

J

Janney, Joseph A., Jr. 122
Jarecki Mfg. Co.....196
Jennison-Wright Co., The.....201
Jessop Steel Co.....139
Johns-Manville Corp.....191
Johnson Steel & Wire Co.....180
Johnson, Wm. C., & Sons Mchry. Co. 209
Joliet Wrought Washer Co.....180
Jones & Lamson Mach. Co..... 42
Jones Mch. Tool Wks., Inc.....213
Jones, W. A., Fdry. & Mch. Co.110

K

Kaalot Mfg. Co..... 69
Kane & Roach.....80-81
Kardong Bros., Inc..... 79
Kearney & Trecker Corp..... 58
Keating, E. F., Co.....144
Kelker Blower Co., Inc.....214
Keller Mechanical Engng. Corp. 61
Kellogg, M. W., Co., The.....125
Kennedy, Julian 128
Keystone Forging Co.....152
Keystone Friction Hinge Co.....214
King, Philip T.....211
Kingsbury Machine Tool Corp.. 56
Kinite Corp. 135-136
Kinnear Mfg. Co..... 48
Kline Hardware Co.....215
Konigslow, E., Stpg. & Tool Co., The 162
Konigslow, Otto, Mfg. Co., The.164

L

L. & D. Pipe Supply Co., Inc..211
Laclede Steel Co.....142
Lake Erie Engineering Corp.... 72
Lamson & Sessions Co., The.... 1
Lancaster Iron Works, Inc.....124
Land, L. J. 210
Landis Mch. Co., Inc..... 27
Landis Tool Co..... 55
Langelier Mfg. Co. 89
Lansing Stamping Co.....164
Lapointe Mach. Tool Co..... 58
Latrobe Elec. Steel Co.....139
Laughlin, Alex., & Co.....126
Lavino, E. J., & Co.....148
Leahy, John W.....209
LeBlond, R. K., Mch. Tool Co.. 57
Lee Spring Co., Inc.....186
Leland Electric Co.....122
Leland-Gifford Co. 56
Leschen, A., & Sons Rope Co...185
Lewis Mch. Co., The..... 87
Lewis-Shepard Co. 99
Liberty Mach. Tool Co..... 60
Linde Air Products Co..... 10
Lindheimer, S. W., Inc.....212
Littell, F. J., Mch. Co..... 71
Llewelyn, Thomas J., & Co.....128
Lodge & Shipley Mch. Tool Co.208
Logansport Mch. Co., The..... 69
Long & Allstatter Co..... 79
Lucas, J. L., & Son, Inc.....209
Lucas Mach. Tool Co..... 58
Luers Bros. Mchry. & Tool Co.214
Lumen Bearing Co.....158
Luna Metal Craft Corp.....214

M

McCann-Harrison Corp. 188
McClintic-Marshall Co. 124
McCullough-Dalzell Crucible Co.105
McKee, Arthur G., & Co.....126
MacCabe, T. B.....211
Machine Tools Sales Co.....209
Machinery Forging Co., The....152
Magnetic Mfg. Co.....104
Malleable Iron Fittings Co.....158
Mallory Mchry. Corp.....210
Manganese Steel Forge Co.....128
Manistee Iron Works Co.....194
Manning, Maxwell & Moore, Inc. 45
Manville, E. J., Machine Co..... 86
Marchant, Geo. F., Co..... 69
Marine Metal & Supply Co.....211
Maris Bros., Inc..... 93
Marr-Galbreath Mchry. Co.....209
Master Products Co., The.....180
Maxwell Corp. 122
Maynard Elec. Steel Casting Co.157
Meaker Co. 53
Meehan Boiler & Const. Co.....124
Meeker Fdry. Co.....158
Metal Specialty Co., The.....164
Michigan Equip. Co.....211
Michigan Steel Tube Prods. Co..144
Midvale Co., The.....153
Miles Machinery Co.....207
Miller & Van Winkle, Inc.....185
Milne, A., & Co.....139
Milton Mfg. Co..... 5
Milwaukee Elec. Crane & Hoist Corp. 33
Milwaukee Forge & Mch. Co...151
Minster Machine Co., The..... 71
Moloch Fdry. & Mch. Co.....118
Moltrup Steel Prods. Co.....128
Monarch Mch. Tool Co., The.... 57
Moorman, James E. F., Co.....207
Morey & Co., Inc.....208
Morgan Engineering Co., The... 75
Morris Machine Works.....194
Morrison Railway Supply Corp.212
Mott Sand Blast Mfg. Co., Inc.104
Mullins Mfg. Corp.....162
Mummert-Dixon Co. 61
Mundt, Chas., & Sons.....166
Murchey Mch. & Tool Co..... 64
Myers, F. E., & Bro. Co.....196

N

Naismith, Geo., & Son.....126
National Acme Co., The.....175
National Alloy Steel Co.....154
National Ass'n of Flat Rolled Steel Mfrs. 161
National Engineering Co.....104
National Forge & Ordnance Co..151
National Mchry. Co.....118
National Roll & Fdry. Co.....106
National Tube Co.....143
Nazel Engng. & Mch. Works...118
Neely Nut & Bolt Co.....179
New Albany Mch. Mfg. Co.... 71
New Departure Mfg. Co..... 40
New England Pressed Steel Co.160
N. Y. Belting & Packing Co....110
Newark Galvanizing Co.....215
Newark Malleable Iron Works..157
Newbold, R. S., & Son Co..... 78
Newport Rolling Mill Co.....139
Newton Mfg. Co.....214
Newton Steel Co.....6-7
Niagara Mach. & Tool Works.. 71
Nicetown Plate Washer Co., Inc.179
Nicholls, W. H., Co., Inc.....102
Nilson, A. H., Mach. Co..... 87
Noble & Westbrook Mfg. Co....202
North American Refractories Co.147
North Wales Machine Co., Inc..215
Northern Malleable Iron Co.....157
Northwest Engineering Co...29, 211
Norton Co. 68

O

Oakite Products Co., Inc..... 52
O'Brien Mchry. Co., Inc...209, 210
Ohio Electric Mfg. Co..... 99
Ohio Locomotive Crane Co..... 94
Ohl, George A., & Co., Inc..... 82
Oliver Farm Equip. Co.....210
Oliver Iron & Steel Corp.....179
Olson Mfg. Co.....179
Orton Crane & Shovel Co..... 94
Osborne & Sexton Mchry. Co...207
Ottemiller, Wm. H., Co., Inc...174
Owen Bucket Co., The..... 92
Oxweld Acetylene Co..... 10

P

Page Steel & Wire Co.....185
Palmer-Bee Co. 34
Pangborn Corporation 104
Parish Pressed Steel Co.....163
Patent Specialty Supply Co., Inc.214
Paul, W. P., Co.....215
Payne, N. B., & Co.....211
Peerless Mch. Co..... 63
Peerless Novelty Co.....169
Pels, Henry, & Co..... 72
Penn Fdry. & Mfg. Co.....215
Penn, Jacob, Inc.....217
Penn Jersey Metals Prods. Corp.214
Penn Screw & Mch. Works....214
Pennsylvania Car Co.....214

Advertisers Index

Pennsylvania Engng. Wks.....126
Pennsylvania Gear & Mch. Co...118
Pennsylvania Pump & Compressor Co. 194
Peoria Malleable Castings Co....157
Perin & Marshall.....126
Perry, Buxton, Doane Co., The.212
Personnel Extension Bureau....217
Petroleum Iron Works Co.....124
Philadelphia Gear Works..... 9
Philadelphia Hardware & Malleable Iron Works, Inc.....179
Philadelphia Steel & Iron Co....152
Phoenix Iron Co.....138
Phosphor Bronze Smelting Co.. 3
Pilling & Co., Inc.....147
Pipe Machinery Co..... 64
Pittsburgh Elec. Furnace Corp..190
Pittsburgh Forgings Co.....151
Pittsburgh Metallurgical Co., Inc.148
Pittsburgh Rolls Corp.....109
Pittsburgh Screw & Bolt Corp... 18
Platt Bros. & Co., The.....144
Plume & Atwood Mfg. Co.....180
Plymouth Locomotive Works... 99
Poole Engng. & Mach. Co.....109
Portable Machinery Co..... 92
Porter Mch. Co., Inc.....213
Potts, Henry, & Co.....210
Pratt & Whitney Co.....46-47
Prentiss, G. W., & Co.....182
Prest-O-Lite Co., Inc..... 10
Production Mch. Co..... 60
Progressive Mfg. Co.....174
Prussian, M., Mchry. Co.....208

Q

Queen City Forging Co.....152
Quickwork Co., The (Not Incorporated — H. Collier Smith, owner) 78

R

Racine Tool & Mch. Co..... 63
Ransohoff, N., Inc.....103
Rathbone, A. B. & J.....176
Raymond Mfg. Co..... 20
Reading Chain & Block Corp... 99
Ready-Power Co.....101
Reed-Prentice Corp. 56
Reed & Prince Mfg. Co.....178
Refined Steel Products Co..... 36
Reliance Machinery Sales Co...209
Republic Steel Corp..... 24
Research Corp. 127
Rhoades, R. W., Metaline Co., Inc. 170
Rhode Island Tool Co.....179
Richards, I. P., Co..... 69
Richmond Forgings Corp.....209
Richmond Malleable Castings Co.157
Ridgway, Craig, & Son Co..... 92
Rivett Lathe & Grinder Corp... 69
Robbins & Myers, Inc..... 99
Robertson, John, Co..... 72
Robinson & Orr.....212
Rock River Engng. Co..... 74
Rockaway Rolling Mill.....209
Rockford Drop Forge Co.....154
Rockwell, W. S., Co.....190
Roebling's, J. A., Sons Co.....182
Roeper Crane & Hoist Works, Inc. 92
Rogers Brown & Crocker Bros., Inc. 147
Ross Power Equip. Co.....211
Ross-Tacony Crucible Co.....104
Royersford Fdry. & Mch. Co., Inc. 60, 215
Russell, Burdsall & Ward Bolt & Nut Co. 4
Russell Mch. Co.....209
Ryerson, Jos. T., & Son, Inc.... 2

S

Sachsenmaier, Geo., Co.....211
Safety Grinding Wheel & Mach. Co. 66
St. Paul Corrugating Co.....214
Samuel, Frank, & Co.....151
Saunders, D., Sons, Inc..... 61
Scaife, Wm. B., & Sons Co....124
Schatz Mfg. Co., The.....168
Schoonmaker, A. G., & Sons, Inc. 210, 211
Schwerdtle Stamp Co., The.....202
Screw Machine Products Corp..174
Scully-Jones & Co.....210
Sellers, Wm., & Co., Inc..... 56
Seneca Iron & Steel Co.....139
Service Steel Co.....144
Sessions Foundry Co., The.....158
Sessions, J. H., & Son.....162
Seymour Mfg. Co., The.....145
Seymour Products Co., The....164
Shakeproof Lock Washer Co....181
Sharon Steel Hoop Co.....140
Shenango Furnace Co.....147
Shepard Niles Crane & Hoist Corp. 97-98
Sherwood, E. C.....212
Shimer, Samuel J., & Sons, Inc.170
Shoemaker Bridge Co.....124
Shore Instrument & Mfg. Co., Inc. 194
Shuster, F. B., Co., The..... 88
Simmons Mch. Tool Corp.....206
Simonds Saw & Steel Co.....128
Sleeper & Hartley, Inc.....86
Sly, W. W., Mfg. Co.....104
Smith, David H., & Sons, Inc.. 79
Smith, F. P., & Co.....180
Smith, Geo. H., Steel Casting Co. 157
Smith, H. A., Mchry. Co.....207
Smith & Mills Co., The..... 60
Smith, Thomas, Co.....160
Smythe, S. R., Co., Inc.....126
Southwark Fdry. & Mch. Co.... 72
Spencer, I. S., Sons, Inc.....158
Springfield Mfg. Co., The..... 60
Stacey Engineering Co., The....102
Standard Appraisal Co.....216
Standard Electrical Tool Co.... 60
Standard Machinery Co..... 87
Standard Pressed Steel Co..176, 215
Stanley Wks., The.....214
Steel Plate Products Co.....122
Sterling Grinding Wheel Co.... 60
Sterling Wheelbarrow Co..... 22
Stevens, Arthur L., Corp.....128
Stewart Die-Casting Corp.....159
Stewart-Warner Corp. 208
Stone, Francis & Hart.....202
Storms Drop Forging Co.....154
Stowe-Fuller Refractories Co., The 148
Streine Tool & Mfg. Co., The.. 78
Strong, Carlisle & Hammond Co., The 26, 188
Strong Steel Fdry. Co.....156
Sullivan Mchry. Co.....198
Summerill Tubing Co.....144
Superior Charcoal Iron Co..... 13
Superior Steel Corp.....142
Swift Electric Welder Co..... 86
Swindell-Dressler Corp. 190

T

Tannewitz Works, The.....64, 213
Taylor, Chas., Sons Co.....148
Taylor & Fenn Co., The..... 59
Taylor Forge & Pipe Wks.....142
Taylor-Hall Welding Corp.....210
Taylor-Wharton Iron & Steel Co. 129-130
Taylor-Wilson Mfg. Co.....105
Taylor-Winfield Corp., The..... 84
Tennessee Coal, Iron & Railroad Co. 133
Thomas Spacing Mach. Co..... 56
Thompson Grinder Co..... 60
Thomson-Gibb Electric Welding Co. 84
Timken Roller Bearing Co.....234
Toledo Machine & Tool Co..... 72
Tomkins-Johnson Co. 63
Topton Fdry. Co.....215
Torrington Co. 87
Treadwell Engineering Co.....157
Troy Engine & Mch. Co.....194
Turner & Seymour Mfg. Co...215
Tyler Tube & Pipe Co.....144

U

Union Carbide Sales Co..... 10
Union Drawn Steel Co.....131
Union Steel Casting Co.....109
Union Switch & Signal Co.....154
Union Twist Drill Co..... 63
United Engng. & Fdry. Co.....105
United Metals Selling Co.....144
U. S. Body & Forging Co., Inc..152
United States Fare Recording Co.194
Universal Boring Mach. Co..... 58

V

V & O Press Co., The..... 71
Valley Mould & Iron Corp.....128
Vanadium-Alloys Steel Co.....139
Vanadium Corp. of America....148
Vaughn Machinery Co., The....104
Veeder-Root, Inc. 193
Vermilion Malleable Iron Co....158
Victor Mchry. Exchange.....210
Virginia Bridge & Iron Co.....126
Vitek Mfg. Co.....204
Vulcan Steam Forging Co.....151

W

Wachs-Gregg & Co.....209
Walter-Wallingford & Co.....151
Wanderman, H. L., Co., The..144
Washburn Wire Co., R. I.....134
Waterbury-Farrel Fdry. & Mch. Co. 88
Watson-Stillman Co. 74, 213
Webb Wire Works, The.....182
Weirton Steel Co.....145
Welker-Hoops Mfg. Co., The....215
West Leechburg Steel Co.....142
West Steel Casting Co., The....157
Western Screw Products Co....174
Westfield Nut Co.....176
Westinghouse Traction Brake Co.199
Wetherell Bros. Co.....138
We Want to Buy Section.....213
Wheeling Steel Corp.....128
Wheelock, Lovejoy & Co., Inc..232
White, A. D., Mchry. Co.....209
Whitney Mfg. Co., The.....110
Whitney Metal Tool Co..... 79
Whiton, D. E., Mach. Co..... 69
Wickwire Bros. 179
Wilcox, D., Mfg. Co.....152
Wilkoff, William, Inc.....214
Williams, J. H., & Co.....154
Wilson-Maculen Co., Inc.....194
Winternitz, Samuel L., & Co...207
Wolverine Tube Co.....144
Wood, R. D., & Co.....200
Woolford, G., Wood Tank Mfg. Co. 122
Worcester Pressed Steel Co....214
Worcester Stamped Metal Co...160
Wright-Hibbard Industrial Electric Truck Co., Inc..... 99
Wrought Washer Mfg. Co.....180
Wyckoff Drawn Steel Co.....134

X

Xenia Fdry. & Mch. Co.....158

Y

Yoder Co., The 109
York Corrugating Co.....162
York Fdry. & Mch. Co.....215
Young Bros. Co.....192
Youngstown Sheet & Tube Co... 32

Z

Zeh & Hahnemann 71
Zelnicker in St. Louis.....212

CLASSIFIED SECTIONS

Clearing House 206-212
We Want to Buy.....213
Contract Work 213-215
Business Opportunities 216
Employment Exchange 216-217

HY-TEN

THE STEEL for MACHINE TOOLS

Apply It As Follows—

"A" No. 1 for

Case Hardened Gears, Spindles, Worms, Cams, Ball Races, Chucks.

"B" No. 2 for

Untreated Spindles, Lead and Feed Screws, Racks, Gears.

"B" No. 3 for

Oil Hardened Gears, Pinions, Shafts, Bolts, Arbors.

"M" Temper for

Oil Hardened Gears, Clutches, Collets.

"B" No. 5 for

Water Hardened Collets, Bushings, Thrust Bearings and Washers, Lathe Centers.

WHY?—

Its quality is certified by a quarter century of successful metallurgical research and by its use in the products of leading manufacturers of every type of machine tool. Its physical properties are excellent—its machining properties unusually free. Prompt delivery—reasonable prices.

Ask us for our "Pertinent Facts" folders.

WHEELOCK, LOVEJOY & CO., INC.

128 SIDNEY ST., CAMBRIDGE A., MASS.

CAMBRIDGE: NEW YORK: CLEVELAND: CHICAGO

Speed reducer efficiency . . . unaffected by passing years

Wear, of course cannot be entirely eliminated from the moving parts of any machine.

A speed reducer wears with use, but contrary to what happens in other types of reduction units, Cleveland Worm Gear Speed Reducers retain their original efficiency to the very end of their production life. The explanation is found in the Cleveland method of generating the gear teeth.

Cleveland gear teeth are cut by hobs made in the Cleveland plant, under Cleveland supervision. In operation the worm meshes with the gear teeth in exactly the same manner as the cutting hob. When wear does finally begin, accurate contours are thus generated on the gear teeth and efficiency of the unit is not lessened in the least.

In speed reducers employing a mechanism other than worm gearing, meshing action takes place in a direction PERPENDICULAR to the direction of the cutting tool. Wear thus causes a distinct change in the tooth contours of such gears. Less efficient transmission of power and rapid deterioration result.

This advantage of unvarying efficiency held by Cleveland Worm Gear Speed Reducers over all other types immediately claims the enthusiasm of equipment and maintenance engineers. For here is a speed reducer you can install in your plant and operate continuously, without worry . . . on any job regardless of its requirements. A speed reducer that will retain its original efficiency to the last day of its life.

Cleveland Type AH Unit driving Vertical Revulcanizers in rubber plant. Ratio 24:1, 1160 r.p.m., 10 h.p.

CLEVELAND

WORM & GEAR COMPANY

3252 EAST 80TH STREET . . . . . CLEVELAND, OHIO

CLEVELAND WORM GEARING · THE ULTIMATE DRIVE

Timken Roll Neck Bearings *in* Continuous Merchant Mill Service

This Mesta continuous merchant mill in the plant of The Timken Steel and Tube Company was the first complete continuous-type rolling mill ever equipped with Timken heavy duty roll neck bearings. It consists of 16 stands, and it rolls 6″ x 6″ billets down to small merchant sections.

In this installation severe rolling pressures (179,000 lbs. at 60 R.P.M.—145,000 lbs. at 50 R.P.M.) are complicated by the necessity of extreme accuracy. Rounds as small as 5/16″ wire have been rolled on this mill, on a production basis, with tolerances that came within .001″ to .0015″. During the entire time that the mill has been in service, the Timken Bearings have acquitted themselves as splendidly as they have in the 28″ and 22″ mills, with all of the characteristic Timken advantages well to the fore, including the rolling of large tonnages without bearing replacement, consistently high average output, 40 to 50% saving in power, pronounced lubrication economy, elimination of mill shutdowns through bearing failures and greatly reduced maintenance costs.

This mill has been operating for better than a year with not a single instance of bearing trouble or failure—a record hitherto unheard of in rolling mill practice.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Exhibiting at The Iron and Steel Exposition Booths No. 129-130

TIMKEN *Tapered Roller* **BEARINGS**

EDITORIAL STAFF

W. W. Macon, *Editor*
A. I. Findley, *Editor Emeritus*
G. L. Lacher, *Managing Editor*
C. E. Wright, *News Editor*
E. F. Cone
R. E. Miller
S. G. Koon
G. S. Herrick
R. A. Fiske, *Chicago*
F. L. Prentiss, *Cleveland*
T. H. Gerken, *Pittsburgh*
L. W. Moffett, *Washington*
Burnham Finney, *Detroit*
Gerard Frazar, *Boston*
R. G. McIntosh, *Cincinnati*

THE IRON AGE

ESTABLISHED 1855

Division of United Business Publishers, Inc.
Member of Audit Bureau of Circulations
and of Associated Business Papers, Inc.

Published Every Thursday by the

IRON AGE PUBLISHING CO.

239 West Thirty-ninth Street, New York

F. J. Frank, *President* G. H. Griffiths, *Secretary*

ADVERTISING STAFF

C. S. Baur, *General Advertising Manager*
W. B. Robinson, *Pittsburgh*
F. S. Wayne, *Chicago*
D. C. Warren, *Hartford*
Emerson Findley, *Cleveland*
B. L. Herman, *Buffalo*
Charles Lundberg, *Philadelphia*
W. C. Sweetser, *New York and New Jersey*
Peirce Lewis, *Detroit and Cincinnati*
C. H. Ober, *New York*

Contents for JULY 10, 1930

Metal Furniture Output Expanding 75
Costs Getting Down as Volume Grows; Simplicity Without Ornament the Rule

What the Open-Hearth Melter Does 78
His Qualifications and Duties Brought Out in Company Classes

Pickling Principles in Galvanizing 82
Temperature Governs Pickling Time, and Must Be Carefully Watched

Japan Buys Much Scrap from Us 84
Took 38 Per Cent of Our 1929 Exports, to Make Own Steel

Gray Iron Electric Melting 87
Continuous Operation Said to Show Economies, Compared With Cupola

Battelle Institute for Research 89
Exceptional Facilities for Metallurgical and Other Investigations

Prices Not Ready to Rise 101
Dr. Haney Believes Steel Prices Will Follow When Commodity Prices Start Up

Pig Iron Production Down Further 114
June Makes Lowest Record Since January; 20 Furnaces Out

Tension Tests of Rivets 79

Latin-American Railroads 79

Conversion Tables for Hardness 80

To Unload 3600 Tons of Ore Hourly 92

Self-Baking Soderberg Electrode 94

Safe Loading for Crated Goods 95

Grinding Tungsten-Carbide Tools 96

Rotary-Hearth Annealing Furnace 97

Ingot Output Down Further in June 107

* * *

New Equipment 98

This Week's IRON AGE in Brief 102

Personal Notes 108

EDITORIALS 110

The Week in Business 113

Iron and Steel Markets 116

Non-ferrous Metal Markets 132

Foreign News 135

Machinery Markets 137

New Trade Publications 142

Division of United Business Publishers, Inc., 239 West 39th Street, New York. A. C. Pearson, *Chairman*. F. J. Frank, *Pres.* C. A. Musselman, *Vice-Pres.* F. C. Stevens, *Secy. and Treas.*

Subscription Price: United States and Possessions, Mexico, Cuba, $6.00; Canada, $8.50; foreign, $12.00 a year. Single Copy 25 cents.

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: 1319 Park Building. Boston: Room 230, 80 Federal Street. Philadelphia: 1402 Widener Building. Cleveland: 1362 Hanna Building. Detroit: 7338 Woodward Avenue. Cincinnati: 409 Traction Building. Buffalo: 616 Ellicott Square. Washington: 536 Investment Building. San Francisco: 703 Market Street.

Copyright, 1930, by Iron Age Publishing Co.

Valuable Facts for You on Turret Lathes

Warner & Swasey
1A, 2A and 3A
Turret Lathes
Powerful All-Geared Head
The Bed
Nickel Semi-Steel Casting
Weight Scientifically Distributed—not mere bulk
The Standard Chucking Equipment
The Covered Ways
Protected Bed-Ways maintain their original accuracy over a long period
There are Three Way Covers

THIS interesting booklet describes the new W & S 1-A, 2-A and 3-A Turret Lathes. It contains concise and complete information as to machine and tool specifications, to help you in the proper selection of turret lathes. If you have not already received a copy, ask our nearest branch office for one—it's free.

Branch Offices

Boston: Chamber of Commerce Bldg.
Buffalo: Iroquois Bldg.
Chicago: 618-622 Washington Blvd.
Dallas: 805 Newell Ave.
Dayton: 710 Mutual Home Bldg.
Detroit: 5928 Second Blvd.
Indianapolis: 4473 College Ave.
Los Angeles: 1118 Santa Fe Ave. The Warner & Swasey Co. of Calif.
Milwaukee: 1143 Wells Bldg.
New York: Singer Bldg.
Philadelphia: 5143 Spruce St.
Pittsburgh: Chamber of Commerce Bldg.
St. Louis: 1627 Locust St.
Syracuse: 108 Grant Ave.

The Warner & Swasey Co.
Cleveland, Ohio, U.S.A.

THE IRON AGE

New York, July 10, 1930

ESTABLISHED 1855 VOL. 126, No. 2

Metal Furniture Output Expanding to Meet Wider Popular Appeal

By LOUISE BONNEY

DEVELOPMENT of new alloys in aluminum and steel has opened new fields to the metal worker. Architects have turned to these for outside trim—spandrels, sills, tower caps and like products, while decorators have promoted their use in interior architecture, fireplaces, radiator covers, decorative trim, and in furniture. Naturally, the metal furniture program is of outstanding interest, since it offers mass production possibilities.

Although the artist-decorators of France, Germany, and America have been concentrating on the problem of adapting metal to furniture for the past few years, the idea is much older. Back in the nineties one of the companies at present responsible for a large mass production metal furniture program was making beds of tubing. Today stock tubings of metals—aluminum, rustless steel, monel metal, and of steel or brass chromium plated or enameled—are being used for furniture in individually designed pieces and in mass production. Welding produces a practically indestructible piece of furniture, and the use of stock forms makes possible a potentially cheap piece. As one of the leading manufacturers of metal furniture says: "Our technical problems are practically solved. The only prob-

BEDROOM Set Made by Simmons Co. of Chromium Plated and Lacquered Steel from Designs of Norman Bel-Geddes

lem which is yet to be solved is that of style."

Simplicity Is Keynote of Newer Styles

The style that seems gradually to be evolving is one of utter simplicity—shaped stock forms, depending on line and proportion for beauty, with no ornamentation and no wood or enamel finish. Metal is inherently as beautiful as wood and the tendency now is to let it depend on itself. In such a program the artist-designer is usually found necessary to give to the pieces the harmony of proportion and the beauty of line necessary.

Obviously there is not much ground for opposition to metal furniture on the practical side. It is basically stronger than wood, and by welding, stronger in fabrication. The metals lighter than wood, such as hollow tubing, have a great advantage for furniture to be used in airplanes, boats, restaurants, ballrooms, Pullman cars and in the home. Metal requires less expenditure for daily care and upkeep. We are informed that a large operating company figures $1.32 upkeep yearly on a straight wood chair, while a prominent restaurant chain adds several thousands of dollars to its operating budget each year, payable to customers whose silk stockings are ruined by splinters.

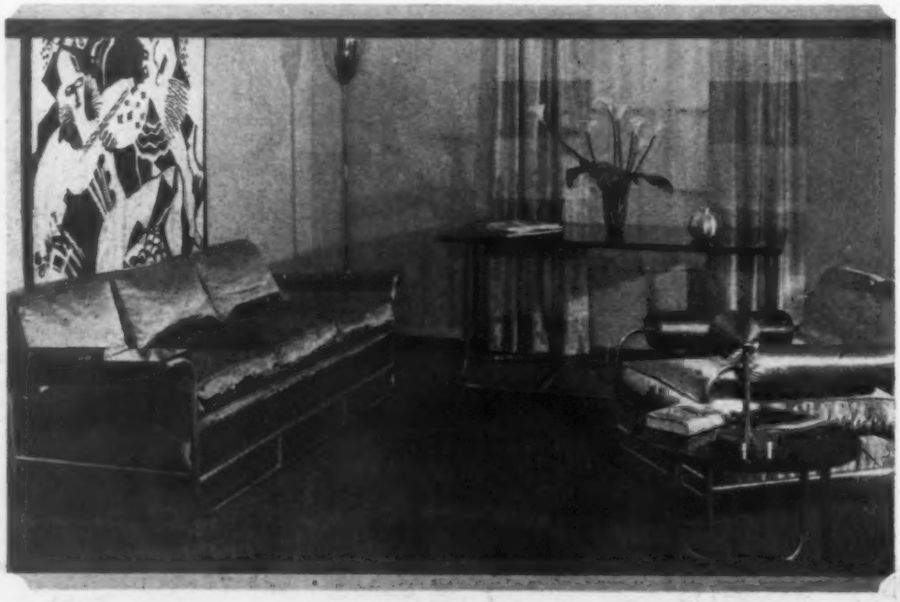
Metal furniture prices at present are competitive with those in good grades of wood chairs, but with mass production should fall much below. A piece of wood furniture has to go through several expensive processes before it is finished—the wood must be prepared and shipped to a distributing point; then it must be cut, assembled, sanded, stained and finished for the simplest model.

Substitute metal in its simplest model and you have only the shaping of a piece of stock metal tubing, the welding of joints, and a certain amount of finishing. Result—none of the elements can disturb it much, human neglect won't affect it, and you have practically an indestructible piece of furniture. Of course, if you add "ornament" problems, production costs increase just as they do with wood which you insist upon carving or embellishing in other ways. But I must take the ground with another artist-designer who says: "The structural qualities of metal are also its decorative qualities, thus annihilating any and every need for ornament."

This has been the policy of the best European designers and is proving its worth in America in the mass production programs of the Ypsilanti Furniture Co. and the Ficks-Reed Co., and in an increasing degree in those of the Simmons Co. and the Aluminum Co. of America. The simulated wood finishes and the simulated wood forms of traditional furniture are giving way to the simpler, more natural conceptions.

High Costs Will Be Lowered

When a manufacturer produces metal models which

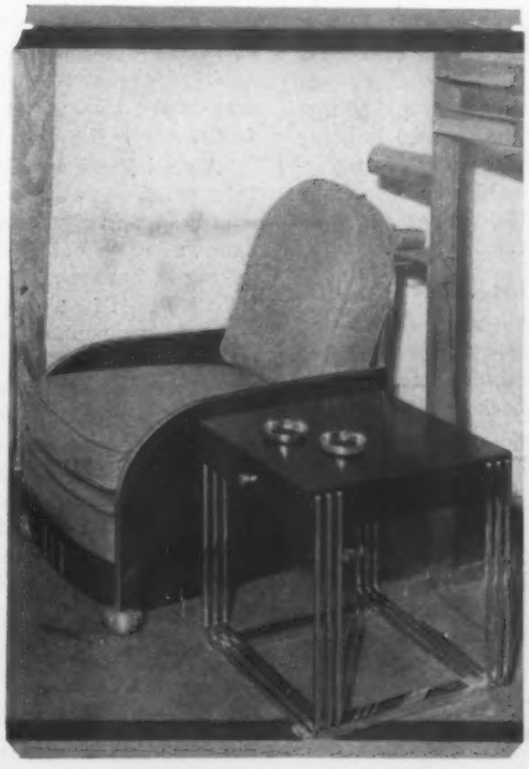


Living Room Furniture of Chromium Plated Steel Designed by Donald Deskey for Ypsilanti Furniture Co.

require 20 processes to finish a single piece because a hangover from the days of wood furniture is dictating a design of "turned wood" inspiration, when only three or four are necessary, he is increasing overhead—machine investment, labor, selling costs. When a manufacturer produces a line with 600 models, 75 colors, and four sizes—a total of—well multiply all those figures for yourself and see the appalling number of potential models for which his factory must be equipped, the ultimate consumer must pay the piper for a lot of things which I hardly believe the ultimate consumer has had any reason to demand.

METAL furniture for the living room, the bedroom, the porch or the terrace has become a definite part of the merchandise carried by every up-to-date store, and, where once were shops which turned out many of the pieces by hand, now there are manufacturing plants, with equipment suitable for doing such work on a production basis. Thus we have the beginnings of a new industry which may ultimately be one of the chief consumers of the newer metals and alloys.

There are other reasons today for high costs which will be lowered materially within a few years—the installation of expensive machinery for a new production; continuing hand fabrication, some of which will give way to machine work; costs of experimentation with a new medium; design costs; and sales costs in fields which have to meet with consumer resistance. This same resistance demanded wood finished metal beds at first because it had always slept in wood beds, but has now given in so that five lacquer finish models are sold to one of wood finish. It has also capitulated before a more radical lacquer and chromium model designed by Norman Bel-Geddes, the sales force reporting no resistance except "price." A hand-made Ford probably would cost several thousands of dollars. A hand-made piece of metal furniture would cost several times that of a machined product. Eventually, however, continuing production and consumer demand will crash through costs. In one of the recent large production programs of metal furniture, for instance, it took 46 hr. to assemble the first piece, and 23 hr. to assemble it after production warranted the installation of the proper mechanical equipment.



Several Companies Now in the Field

In addition to the production programs of the Aluminum Co. of America, Ypsilanti Furniture Co., Ficks-Reed Co., Simmons Co., and what we hear are prospective plans of the General Fireproofing Co. of Youngstown, several other companies have entered the field of metal furniture manufacture, among them the Metal Art Craft Fixture Co., 418 West Forty-second Street, New York; the Modern Metal Furniture Co., 232 East Thirty-seventh Street, New York, and the Displaymode Co., 425 Fifth Avenue, New York. Some of the New York department stores, most prominently the Lord & Taylor Co., have been working out designs for metal furniture in their own studios.

Donald Deskey, a well known designer, has been responsible for the metal furniture designs of the Ypsilanti Furniture Co., while Norman Bel-Geddes has created forms for the Simmons Co. The Ypsilanti company uses steel in stock forms, chromium plated or lacquered. The Simmons Co. manufactures its own tubing, which it uses with a lacquered or chromium-plated finish. The Ficks-Reed Co. puts out its products in lacquered finish, while the Aluminum Co. of America uses largely the unfinished aluminum alloy. Artist-designers are using chromium-plated steel or brass tubes and bands, aluminum tubes and bands, monel metal tubes and bands.

The Ficks-Reed program consists only of outdoor furniture, while the Ypsilanti company makes garden and terrace furniture and also living room and dining room models. The Aluminum company has specialized in office furniture, chairs for Pullman cars, restaurants, beauty parlors, airplanes and other purposes.

Obviously, the popularity of penthouses, terraces and gardens in city living, and of sun parlors, country clubs and terraces in the suburban sections opens up a large field for any type of furniture resistant to all kinds of weather. Continental and American tendencies to use metal in interior architecture and the more attractive forms in which furniture of metal is now being produced should make it possible for this type of furniture to displace wood in many places in which the latter is now largely used.

The greatest successes will come to the metal which offers most resistance to the elements, which reduces overhead in homes, offices and public rooms and which can be worked most easily and purchased most cheaply in stock forms. There can be no doubt that metal is the future material.

Qualifications and Duties of Open-Hearth Melter

BY MARTIN J. CONWAY*

FOR the work on each open-hearth furnace, two men are required: a first helper and a second helper. Besides these there is a melter, a foreman in charge of a number of furnaces.

Ordinarily the first helper has charge of the furnace except at tapping the heat. He informs the charging machine operator of the amount of ore the charge will require and how and where to place the various parts of the charge; he regulates the heating of the furnace; he directs any repairs necessary during the operation and has charge of the working of the heat, that is, making the necessary additions of ore, pig and lime to prepare the steel for tapping. But when the heat is ready to tap the melter foreman takes charge. The first helper, subject to the supervision of the melter, actually taps the heat, and, after doing so, he directs the repair of the bottom and helps make up the banks.

The second helper keeps a supply of dolomite, ore and lime on hand and places the recarburizing additions on the platform convenient to the ladle. He helps to work the heat, digs the plug out of the tapping hole when the heat is ready to tap, keeps the tapping hole open and clean while the furnace is being rabbled and assists in making up the banks of the furnace, preparatory to recharging. He also attends to the plugging of the tapping hole, relines the steel spout after each heat and cleans around the furnace.

Qualifications for a First Helper

Primarily the first helper should know his furnace, its construction, design, layout of sewers, valves, air intakes, burners—in fact, everything pertaining to his furnace from the top of the buckstays to the base of the stack. He should also know how to recognize good combustion and how to obtain it by proper handling of the fuel, air and draft. He also should carefully supervise the regenerator chambers, which are under his control.

To maintain the maximum efficiency and obtain the best results, the first helper must store all of the heat energy possible in the checker chambers while pulling lime and getting his heat ored down and ready to tap, by carefully reducing the amount of air passing through from the air inlets so that he can open up the air valves while he is charging and melting down his charge. Speed can also be made by starting to work the heat at the correct time and working it properly. The most time can be gained during the melting down period.

He should also keep his furnace in proper repair, the bridge walls, blocks, slopes, ports, banks and bottom. The thing that causes the most delay is a neglected bad bottom; the things causing the greatest loss of fuel and time are bad bridge walls, bad blocks and slopes. Bad bridge walls are usually caused by the wrong flame direction and improper combustion.

Most bottom troubles are caused by the careless repairing or fixing of the bottom, by not properly bailing or rabbling the steel and slag out of the holes and by putting more repair material in at one time than will properly set solid. It is strictly up to the first helper to make the furnace bottom right; it is also up to him to keep the metal at a safe temperature until he is ready to pull the heat, and he must get the heat in the ladle just as soon as possible after it is ready.

A good first helper knows that there are about five things that will cause a furnace roof or walls to burn, namely: an empty furnace, scrap melted smooth and shiny, a heavy coat of lime, metal too hot, or careless setting of burners. Therefore the first helper's duty is to see to it that any furnace delay beyond his control does not punish the furnace brickwork. He will watch his furnace constantly for anything that will work to his advantage, such as the composition of his charge, the way it is charged, the percentage of pig and scrap, the melting down of the scrap so as not to over-oxidize the charge and cause soft melts, and will shut down until there is more scrap in sight. He will also watch the second helper, and see to it that he makes the joint and spout properly so it will safely carry the heat into the ladle.

Duties of a Good Melter Foreman

The melter or foreman has charge of a group of six or seven furnaces.

He takes charge of any furnace in this group when any serious difficulty arises, and he always has charge

*Fuel engineer, Lukens Steel Co., Coatesville, Pa. These notes are from lectures used in classes for open-hearth furnacemen, conducted in the Lukens plant, as described in THE IRON AGE, Sept. 12, 1929, page 671.

during tapping the heat. He receives the orders for the steel desired, so when the tapping time of a heat is near he orders the recarburizers and takes charge of the furnace when the carbon is but a few points above the tapping point. He decides when the heat is ready, gives the order to tap and directs the addition of the recarburizers. He gives the order for lifting the full ladle, and inspects the bottom of the furnace after the heat is out.

He must know his job, be willing to add to his store of knowledge, and be able to get his knowledge across to the men under him.

He must cultivate personality in order to make his men have faith in him and willingly do their utmost.

He must know good combustion and how to obtain and maintain it constantly.

He will watch (and inspire the men under him to watch) the mix going into the furnaces to prevent excessive high and low melts which consume time, fuel and unnecessary labor. Scrap costs $16 a ton and pig iron $21 a ton, and any pig iron that is charged unnecessarily costs the company the difference, or $5 a ton. This applies to the high melts. Low melts require from 2 to 10 tons extra iron (costing $10 to $50 more than necessary), besides from one to six hours getting the charge melted and hot. In addition to the fuel lost and extra time a bad heat of steel is made.

He must know how to get a heat in shape by having the best slag conditions, and should be able to convey to the men under him this knowledge and firmly encourage them to get the heat into that condition. He is hired to instruct and see that his instructions are obeyed, not to do the work himself.

He will positively demand that his helpers run the metal on the cool side until the heat is in shape. If only a reasonable time is allowed to get the heat hot and tapped, many holes and bad bottoms will be eliminated.

He will impress on his men the price that has to be paid in dollars and cents for all delays which they can prevent themselves.

He will never hesitate to ask his superior for any information or help that will improve himself, his men or his company.

He will not allow his men to loaf in another department nor will he allow men from other departments to loaf in his department. When the head of the steel making department is busy, or elsewhere, or at home, he is absolutely responsible for what happens in the department under him.

He will plan his work ahead so as to eliminate all delays possible in charging and tapping his furnaces.

He will always have a man ready to take his or another man's place so that the efficiency of his department will not suffer from sickness, vacation or accident.

He will always watch the work of his men closely and promote them according to their ability and not because of personal reasons.

His biggest job as well as that of his superior is to cause the men to think and use their brains.

LUKENS STEEL CO. has found that worthwhile economies in steel manufacturing have resulted from an annual class for open-hearth melters and helpers. Topics discussed concern the design and operation of the furnace, the duties of each workman, how he can improve his own position and the overall costs of steel making, and lessen the danger of off-heats. From some of the notes prepared by the leader of one of these classes, these very practical suggestions concerning the duties of melter and first helper are gleaned.

Tension Tests of Rivets

RIVETS in tension are prohibited in some specifications for steel structures. To determine the strength of rivets in tension and to determine the initial tension in the rivets, an investigation was made in the Engineering Experiment Station of the University of Illinois which is reported upon in Bulletin No. 210, of 38 pages, copies of which may be had for 25c.

It was found that the strength in tension of hot-driven rivets with two-button heads was slightly greater than the tensile strength of the original rod. Rivets with flattened heads developed 90 per cent of the rod strength. Cold-driven rivets showed a strength considerably above that of the rod.

Rivets with a long grip were not quite so strong as those with a short grip. This was attributed to the fact that they did not fill the holes so completely over the entire length. There was no indication of any lack of reliability of rivets subjected to tension. The ability of a rivet to resist an external load producing tension is not reduced by the initial tension in the rivet, caused by cooling.

Foreign Railroads as Export Aids

Five volumes of Latin-American railroad analyses have been put out by the Department of Commerce transportation division and another is to appear. These have been put together with the idea that they will be of distinct value to American exporters in connection with their business with the various Latin-American countries.

One volume covers Chile; another takes up Argentina; a third includes railroads of Bolivia, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, the Guianas; a fourth, which has not yet come out, will cover Brazil. The two other volumes are respectively for Mexico and for Central America and the West Indies.

All the volumes are well equipped with maps, diagrams of various sorts, statistical data as to exports and imports of the country involved, characteristic features of the individual railroads as to their rolling stock, financial affairs, etc., and a survey of the principal products handled over the various lines. The volume for Chile runs about 385 pages, while the others are of corresponding length.

Methods of purchase, finances, traffic statistics, analyses of railroad supply markets, conditions of repair shops and equipment, names of operating officials and many other pertinent facts are brought out for each principal railroad, and aggregates, where possible, are given for the countries involved.

New Conversion Tables Show

BY T. N. HOLDEN, JR.*

A HARDNESS measurement conversion table, which is quite unique and one which, I believe, will fulfill a long-felt want, came to me recently from abroad. It has proved of such great help that, after some revisions, I am passing it on for the benefit of others. Of course, it is only approximate, as all hardness conversion tables are. It applies mainly to alloy steels, although I have found it applicable to other steels.

I have compared it with the latest table published by the International Nickel Co., showing the relationships among Rockwell, Brinell, Shore and tensile strengths of alloy steels. The two check very closely so far as they go, but this one goes further. It compares hardness obtained with the Rockwell using three loads, 150, 100 and 60 kg., with the diamond penetrator. It is this last part that has proved so valuable, and I believe that there is none other like it ever published.

With this table one may test finished parts without marking them much more than with the scleroscope. To illustrate: For example, one desires to Rockwell some gudgeon pins, wrist pins, etc., all hardened and finished ground. If this is done in the usual way, with a 150-kg. load, one will leave such a large indentation that it is necessary to stone them afterward to remove the impression left. Instead of using the 150-kg. load, remove the 50 and 40-kg. weights, then proceed in the regular way, as if using the 150-kg. load. Read the same scale: If it shows C75, refer to C75 in the table under 60-kg. load. Opposite under 150-kg. load is C48. The indentation on the piece is so small that stoning is not necessary and thus time and labor are saved.

Another instance: One has a piece that is pack hardened, with only a thin case, so thin that the 150-kg. load with diamond penetrator breaks through the case, and consequently does not give a true reading. Remove the 50 and 40-kg. load and apply the test as before. Take the reading: If it is 83, look for 83 under the 60-kg. load and opposite under 150-kg. load is 63. Therefore the hardness is C63.

I have also found the table useful for testing the hardness of irregularly shaped pieces, where it was impossible to support them firmly, and reading with 150 kg. was not dependable. Using a 60-kg. load gave a more accurate determination.

*Metallurgist, E. W. Bliss Co., Brooklyn.

ROCKWELL				BRINELL				
	Diamond C Scale			10 M/M Ball 3000 KGM Load				
1/16 Ball 100 KGM B Scale	150 KGM	100 KGM	60 KGM	Diam. of Ball Impression in M/M	Hardness Number	Equivalent 1000 Lb. Sq. In.	Vickers or Firth Diamond Hardness Number	Scleroscope
				2.00	946	464		
				2.05	898	439		
				2.10	857	419		
				2.15	817	399		
	72	82	89	2.20	782	383	1220	107
	69	80	87	2.25	744	365	1114	100
	67	78	85	2.30	713	350	1021	96
	65	76	84	2.35	683	334	940	92
	63	74	83	2.40	652	318	867	88
	61	72	82	2.45	627	307	803	85
	59	71	81	2.50	600	294	746	81
	58	69	80	2.55	578	282	694	78
	56	68	79	2.60	555	271	649	75
	54	67	78	2.65	532	260	606	72
	52	65	77	2.70	512	251	587	70
	51	64	76	2.75	495	242	551	68
	49	63	76	2.80	477	233	534	66
	48	62	75	2.85	460	226	502	64
	47	61	74	2.90	444	217	474	61
	45	60	73	2.95	430	210	460	59
	44	59	73	3.00	418	205	435	57
	43	58	72	3.05	402	197	423	55
	41	57	71	3.10	387	189	401	53
	40	56	71	3.15	375	183	390	52
	39	55	70	3.20	364	178	380	50
	38	54	69	3.25	351	172	361	49
	37	53	69	3.30	340	167	344	47
	36	52	68	3.35	332	162	335	46
	35	52	68	3.40	321	157	320	45
	34	51	67	3.45	311	152	312	44
	33	50	67	3.50	302	148	305	42
	31	49	66	3.55	293	144	291	41
	30	49	66	3.60	286	140	285	40
	29	48	65	3.65	277	136	278	39
	28	47	65	3.70	269	132	272	38
	27	46	64	3.75	262	128	261	37
	26	45	64	3.80	255	125	255	36
	25	45	63	3.85	248	121	250	36
100	24	44	63	3.90	241	118	240	35
99	23	43	62	3.95	235	115	235	34

Relations Among Hardness Tests

Although I have not yet tried it, I believe this chart will allow for more accurate determination of hardness of thin stock, such as razor blades, and also I believe it will measure with a fair degree of accuracy cyanided parts.

Economics of Industrial Electric Heating

FACTORS affecting the economics of industrial electric heating were discussed before the World Power Conference in Berlin by N. R. Stansel, industrial engineering department of the General Electric Co., Schenectady, N. Y. The following notes were taken from the paper:

The economic status of the electric furnace for the manufacture of steel castings in foundry service is based largely upon the ease with which this furnace can be fitted into any production schedule and on its effective use of scrap metal. Furnace sizes in this service usually are from 1 to 5 gross tons holding capacity. For operating periods of 24 hr. an energy consumption of from 500 to 600 kwhr. per ton is easily obtained. In intermittent service this figure averages about 800 kwhr. per gross ton. In this service the electric furnace is a flexible tool that makes possible the utilization of scrap metal for the economical production of high grade castings on a moderate scale.

The energy required for making steel in an electric furnace varies in amount with the type and size of the furnace and with the method of manufacture. The average value is about 800 kwhr. per gross ton. The proportion that the cost of this energy bears to the total cost of the heat process is variable. At current rates for electric energy it is not a major item.

The economics of baking oil sand cores for foundry service has not been studied as thoroughly as its importance deserves. The wide range in sizes of cores does not permit an exact statement of the electric energy required for core baking. Results from a number of electric core baking ovens show from 2 to 17 lb. of cores per kwhr., depending on the size of the cores. The cost analysis of this operation should be included as a part of the cost analysis of the castings.

ROCKWELL				BRINELL				
	Diamond C Scale			10 M/M Ball 3000 KGM Load				
1/16 Ball 100 KGM B Scale	150 KGM	100 KGM	60 KGM	Diam. of Ball Impression in M/M	Hardness Number	Equivalent 1000 Lb. Sq. In.	Vickers or Firth Diamond Hardness Number	Scleroscope
98	22	42	62	4.00	228	113	226	33
97	21	41	61	4.05	223	109	221	33
97	20	41	61	4.10	217	106	217	32
96	19	40	60	4.15	212	104	213	31
95	18	39	60	4.20	207	101	209	30
94		38	59	4.25	202	99	201	30
93		37	58	4.30	196	96	197	29
92		36	58	4.35	192	94	190	29
91		35	57	4.40	187	91	186	28
89		34	56	4.45	183	90	183	28
88		34	56	4.50	179	89	177	27
87		33	55	4.55	174	88	174	27
86		32	55	4.60	170	86	171	26
85			54	4.65	166	85	165	26
84			53	4.70	163	84	162	25
83			53	4.75	159	82	159	25
82			52	4.80	156	80	154	24
81			52	4.85	153	79	152	24
80			51	4.90	149	77	149	23
78			50	4.95	146	75	147	23
76			50	5.00	143	73	144	22
76				5.05	140	72		
75				5.10	137	70		
74				5.15	134	69		
72				5.20	131	68		
71				5.25	128	66		
69				5.30	126	65		
69				5.35	124	63		
67				5.40	121	62		
66				5.45	118	61		
65				5.50	116	60		
64				5.55	114	59		
62				5.60	112	58		
61				5.65	109	56		
59				5.70	107	55		
58				5.75	105	54		
57				5.80	103	53		
56				5.85	101	52		
54				5.90	99	51		
53				5.95	97	50		

Electric Brass Melting

The brass industry is a large user of electric heat in melting service. The average quantity of electric energy used to melt a net ton of brass varies from 275 to 300 kwhr. The average rate for this service is nearer 2c. than 1c. per kwhr., say an average energy charge of $5 a ton. The additional cost of operating the brass melting furnace (for labor, linings, metal loss, maintenance, etc.) seldom exceeds $5 per ton and is generally less. Thus the energy cost is a large item in the total cost of the heat operation. Under this condition, the electric furnace has established its economic value in comparison with fuel burning by the gains from:

a. The reduction in metal loss.

b. The production of alloys of definite compositions and of homogeneous structures.

c. Definite temperatures.

d. The safeguarding of the health of the workmen around the furnace.

Pickling Principles in Galvanizing

Pickling Time Depends Upon Temperature of Pickle — Bad Results of Excessive Temperature

BY WALLACE G. IMHOFF*

MANY practical conditions affect the pickling time. The purpose of this article is to illustrate, by a few specific examples, that the pickling time depends upon the temperature of the pickle. This is one of the definite basic principles of the art of pickling. Other principles and facts will for the time be placed in the background and be considered as standard conditions, while the relation between pickling time and temperature of the pickling solution are discussed.

Many of the facts of pickling have been well known for a long time by practical picklers. But not until lately have these facts been organized into basic principles upon which to conduct practical plant operations.

Pickling time is not one of the controlling factors in the art of pickling. It is rather an effect, or the result of the combination of the other factors which are the controlling elements. These elements are the acid strength, the temperature of the pickle, the thickness and the kind of scale to be removed, the contamination of the bath with iron salts, agitation, and similar features.

Speeding Up Operation with Stronger Acid

By varying the percentage of acid the operation can be safely speeded up or slowed down within wide limits to meet the demands of production. The better practice, however, is never to use more than an 8 per cent or 10 per cent solution of sulphuric acid. Beyond this point appreciable quantities of acid are lost, or time is wasted in completely exhausting the bath when it becomes too foul to be fit for longer use. For ordinary purposes a strength of 4 to 6 per cent acid will pickle the average work in 30 to 40 min. pickling time, depending upon the temperature of the bath.

The relation between the pickling temperature and the pickling time is clearly shown by the data in Table I. These were obtained under practical plant conditions when 10 lots of regular-grade water pails were pickled in a bath of 4.25 per cent acid strength.

*President, Wallace G. Imhoff Co., Consultant in Zinc Coating (Hot Galvanizing), Vineland, N. J.

Table I—Temperature Influence on Time of Pickling

Lot	1	2	3	4	5	6	7	8	9	10
Temp'ture	120°	120°	...	...	...	...	106°	102°	...	101°
In pickle	7:42	8:03	8:17	8:32	9:08	9:20	10:00	10:12	11:10	11:20
Out of pickle	8:23	9:00	9:10	9:50	10:02	11:00	11:13	11:43	12:38	1:48
Pickling time, min.	41	57	53	78	54	40	73	91	88	88

*These figures show that as the temperature of the pickle dropped from 120 deg. Fahr. to 101 deg., the pickling time increased from 41 min. to 88 min.

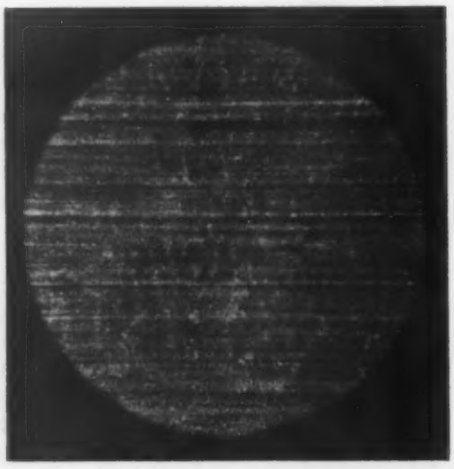


FIG. 1—Surface of Hot-Rolled and Annealed Steel Base Before Pickling. Magnified 36 diameters

The important thing to bear in mind is that proper results can be obtained only when the pickling conditions have been standardized. It is a difficult thing to standardize the pickling time unless some of the other more important controlling factors have been standardized. For example, it is neither possible nor practical to try to standardize the kind of scale and oxide to be removed from the iron or steel base. On the other hand, it is not only possible, but extremely practical, to standardize and control the pickling bath temperature.

Temperature Control Effects Many Savings

By definitely controlling the temperature of the pickling bath, and installing standard conditions of pickling, a direct saving of acid, steam, labor and time will result. In addition, the quality of the product will be improved and better pickling conditions established.

Uniform results and controlled production can be had only when the pickling conditions are known.

If the time element is not in line with production requirements, then the acid strength may be increased or decreased to meet the demand, or more pickling capacity may be installed to suit production. Automatic temperature control of the pickling bath immediately places pickling operations on a scientific basis, prevents the solution from boiling over on the floor, and establishes a uniform temperature which results in uniformly pickled articles.

Sometimes only a few degrees difference in temperature will produce a marked difference in the pickling time and the results obtained. Over-pickling and under-pickling are much less liable to occur when the temperature of the bath is known and definitely controlled.

The rapid strides made in

the last few years in the other branches of steel making and fabricating demand that the old-time pickling practice be abandoned in favor of the new, which is an art. It is, indeed, a science, based on definite basic principles, controlled by modern scientific instruments, and operated with modern pickling equipment of the latest design and construction.

Speed Often Is at Expense of Quality

Production and quality are two features always sought for in pickling operations, the same as in other operations. One of the quickest ways of speeding up production is to raise the temperature of the bath. In other words, as the pickling bath temperature is increased, the pickling time is decreased. And as the pickling bath temperature is lowered, the pickling time is increased. This was clearly shown in Table I. When the temperature of the bath dropped from 120 deg. to 101 deg., the pickling time increased from 41 min. to 88 min.

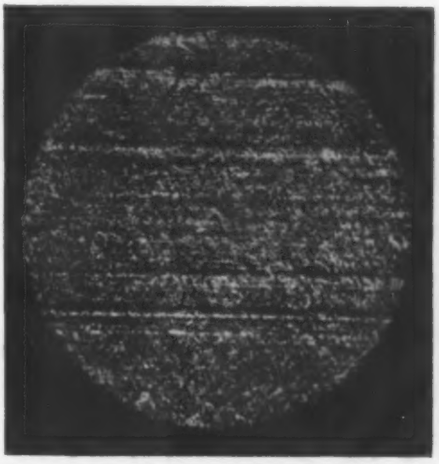


FIG. 2—Surface of Hot-Rolled and Annealed Steel Base After Pickling the Right Time. Magnified 36 diameters

Unless close check is kept on the pickling bath and pickling conditions, however, raising the temperature of the bath to meet production requirements may exert a harmful result upon the product. Since the results obtained are a function of the pickling conditions, it is well to know and understand just what effect the change of conditions has upon the product.

As an example, suppose the weight of zinc deposited as galvanized coating is to be considered. A practical example will show the effect of increasing the pickling time from 5 min. to 55 min. The iron dissolved, and the weight of zinc deposited, are directly affected by the pickling time, as shown in Table II.

Table II—Relation of Time to Result

Pickling Time	Iron Dissolved	Zinc Deposited as Galvanized Coating
5 min.	1.70 units	18.00 units
8 min.	3.20 units	18.20 units
12 min.	3.40 units	19.90 units
55 min.	6.50 units	25.00 units

Table II brings out clearly the effect of variables. Each individual component has an entire series of variables. In addition to these components there are many others not shown, such as acid strength, temperature, iron salt contamination, etc. A different result is seen at every stage, which emphasizes the great importance of reducing to standard conditions the factors which can be controlled.

Pickling temperature is one controlling factor which can be, and should be, accurately controlled. There are now on the market a number of excellent pickle-tank temperature control instruments. Some of the more progressive plants have taken advantage of the big savings obtainable by using these automatic controls. Others have installed automatic temperature control instruments because the quality of the product is far superior to the product pickled with a variable, uncontrolled, temperature.

A feature of great importance in pickling wire is "acid brittleness." Much has been written upon this subject, but right here is a proper place to show the effect of pickling for a long time at a high temperature. In one plant a whole carload of material was returned because the wire, when placed in service, snapped readily, and showed extreme conditions of acid brittleness.

In the plant where this occurred, pressure had been laid on the picklers to save acid. As a result they had been saving acid. But, to get out the production required, they had raised the pickling temperature to the boiling point of the solution. The acid was extremely weak, 1 to 1.5 per cent, and the pickling time very long, 60 to 90 min. A close check up on the practical conditions present showed the following:

1. The acid was extremely weak.
2. The temperature was right at the boiling point of the solution.
3. The material was in the pickle a long time.
4. Live steam was used to heat the bath.

The practical value of installing automatic temperature controls on the pickling tanks can now be seen at once. The boiling point was the automatic temperature control which produced the acid brittleness by the old method. The proper pickling conditions should be a 4 to 5 per cent acidity, a temperature at the highest of not over 170 deg. Fahr., and a pickling time of about 20 min.

I believe it is much better pickling practice to keep the temperature down, say at least to 160 deg. If necessary, to get out the proper amount of production, more pickling tanks should be installed and the pickling capacity thus increased. The temperature should by all means be controlled by an automatic device. In addition to this modern standardized practice, a good inhibitor should be used.

Cause Difficult to Determine

That the subject of acid brittleness is extremely hard to penetrate, as to the real cause, is borne out by an excellent research made by H. Sutton, the results of which were presented in a paper before the Iron and Steel Institute.* I have been able definitely to trace "acid brittleness" to pickling with a very weak acid, for a long time, at the boiling point, using live steam to heat the bath.

Contrary to these conditions, Mr. Sutton has shown that "cold-rolled strips were embrittled seriously by pickling in 10 per cent sulphuric acid solution (by volume), at all temperatures up to the boiling point." Many of the other steels tested by him showed acid brittleness also, which emphasizes the importance of standardizing those conditions, in the art

(*Concluded on page* 131)

*The Influence of Pickling Operations on the Properties of Steel, by H. Sutton. Journal of the Iron and Steel Institute, No. 1, 1920, Volume CXIX, pages 179-216.

Japan's Steel Industry Has Become Our Best Scrap Customer Abroad

BY GEORGE S. HERRICK*

THE shift of emphasis in Japan's imports of steel in the past half-dozen years has been remarkable. From a good customer for finished steel products, our Pacific neighbor has become a large buyer of raw material in the form of steel scrap.

In 1923, Japan's steel producers bought less than 9000 tons of steel scrap from the United States, but Japanese purchases of light gage black sheets from all countries was close to 250,000 gross tons. By 1929, the position of these two products had been completely reversed, for Japan imported 208,260 tons of steel scrap from the United States alone and bought for importation only 79,873 tons of light gage black sheets.

THE remarkable growth of American iron and steel scrap exports in a few years, from 65,980 tons in 1923 to more than a half million tons in 1928 and 1929, has placed the United States in the position of scrap supplier to the rest of the steel-producing world and especially to the growing Japanese steel industry. Our exports of steel scrap to Japan have shown a steady upward trend in the past half-dozen years, increasing from less than 9000 tons in 1923 to 208,260 tons in 1929, or about 38 per cent of the exports of 552,372 tons of American scrap to all countries.

Our other customers, even though many are larger and more important steel producers than the Japanese, were considerably smaller buyers of scrap. Canada, our second largest customer, reached a total last year of 11,849 tons; Italy, our leading European user, took 87,863 tons; Poland bought to the extent of 75,031 tons and Germany received only 20,330 tons of American scrap.

Japan is in a slightly different category. A rapidly growing domestic steel industry is faced with the serious problem of iron ore supplies, and unsettled conditions in China during recent years have seriously hampered Japan's imports of Chinese iron ore. Formerly, when the Japanese steel industry was merely a lusty infant producing a few hundred thousand tons of steel ingots annually (254,952 tons in 1913), a sufficient supply of steel scrap was obtainable from India and Australia and a minor tonnage from China. But with the total steel ingot output in excess of 1,000,000 tons annually, the limited supplies from India, Australia and China have become inadequate and heavier charges of scrap per ton of ingots require greater supplies.

Of the Japanese steel mills, the Government owned steel works at Yawata produces more than half the steel ingots annually and is the buyer of more than half the foreign steel scrap used in Japan, taking about 120,000 gross tons of practically all No. 1 heavy melting steel in 1929. Some No. 2 heavy melting steel is bought by privately owned mills, but such purchases are usually small and do not compare in importance with the contracts for 10,000 to 30,000 tons placed here for first grade old material.

Bought Through Own Trading Companies

While exports of scrap to the Far East are at a low ebb at this writing, the slackening is temporary. Japanese foreign trade, a substantial share of which is with China, has been severely curtailed by unsettled Chinese political conditions, so that in the past six months, the Imperial Steel Works has bought scrap sufficient for the rest of the year, based on the present scale of operations. The company has more than 100,000 tons of heavy melting steel in stock or in transit from the United States and its other sources of supply.

Purchases of scrap are handled largely through

*THE IRON AGE, New York.

Japanese trading companies with branches in the United States. These act as brokers, contracting with the consumer in Japan for a specified tonnage, which is bought from brokers and dealers in the United States, who agree to deliver from 1000 to 5000-ton cargoes to certain ships at specified times. The largest operator in this trade, Mitsui & Co., with offices at 65 Broadway, New York, ships more than 60 per cent of the steel scrap taken by Japanese consumers and was the buyer of more than 100,000 tons of scrap exported from Houston, Tex., to Japan in 1929.

The usual Japanese specification for No. 1 heavy melting steel calls for wrought and steel scrap with minimum thickness of ¼-in., width 2 ft. and maximum length 5 ft. Shipments must not include cast iron, alloy steel or automobile scrap, steel pipe, black sheets, or wire and wire nails and must be free from heavy rust.

Preference is given to scrap rails, 50-lb. and heavier, and accessories. The specification calls for good quality, consisting of all T-rails, up to 33 ft. in length with a minimum of 5 ft. to be reasonably straight and free from bends, twists and rust. Accessories must include only angle bars, bolts, nuts or spikes.

In addition to providing desirable melting stock, rails permit better stowing of the cargo on a vessel and are more acceptable to the shipping companies for this reason. Steamship lines usually estimate that 40 cu. ft. of space in the hold is sufficient for one ton of material, but this space is often exceeded with ordinary No. 1 heavy melting steel because of irregular shapes, so that 50 to 60 ft. per ton is at times required.

BARGES of About 110 Tons Capacity Are Used in the Harbor at Osaka to Lighter Scrap from Ship to Shore. This photograph was taken by the Japanese buyer to justify claims against the shipment, which included steel in a cargo bought as heavy cast iron scrap

Magnet or Bucket Used to Load

Scrap is considered far from desirable by ocean carriers, partly because of the danger of damage to the ship in loading and unloading and partly because much of it does not stow easily. Based on its low value as a raw material used in steel making, however, it takes freight rates from Atlantic and Gulf ports to Japan of $5.50 to $6 per ton, while the minimum charge on pig iron is $6 and the usual finished steel product rate is about $8 a ton, c.i.f. Japan.

In loading scrap for ocean shipment, the material is either trucked to the dock from nearby supplies, or

shipped in carload lots from a distance. In either case it is handled into the ship by a large magnet, sometimes up to 65-in. in diameter, or with a bucket of about 1-ton capacity. While the magnet transfers scrap more rapidly from the car to the hold of the ship, it does not permit careful distribution of the cargo, so that the ship is sometimes not properly trimmed. When the magnet is used a bed of scrap is first laid in the bottom of the hold by lowering the magnet and spreading the material by hand. When the bottom has thus been protected, the magnet is operated only to the hatch opening, where it releases its load.

Buckets are occasionally large pail-type containers, loaded by hand, but often a section of boiler plate formed into a half-round is used with chains at the four corners. The bucket offers a considerable advantage over the magnet, as when it is lowered to the bottom, the scrap is distributed until the ship is properly trimmed, so that the longer loading time is offset by a better distributed cargo.

THE Old Rails Above Will Be Accepted by the Japanese Mill At a Reduction in Price Because of the Excessive Amount of Cement Adhering. (Below) Loading old rails at Norfolk, Va.

THIS Railroad Grade of Heavy Melting Steel (Left) and the Locomotive Scrap (Above) May Occupy More Than the Usual 40 Cu. Ft. Per Ton in the Hold of the Vessel, But It Is Highly Desirable Material

At Houston, where a major part of the scrap for Japan is exported, a dealer in export material has recently been using a German-made, magnetized, orange peel bucket known as a Polyps. Shippers in Houston have been urging the railroads to install a coal-tipple to handle scrap, pointing out that a tipple would permit loading a 5000-ton cargo of scrap in 24 hr.

Claims Not Unusual

Exportation of scrap is not without difficulties, for both buyer and seller. The trading company contracting to furnish No. 1 heavy melting steel is obligated to furnish the grade specified, or, as in the domestic scrap trade, be subject to rejection of material or reductions in the price when the quality is inferior.

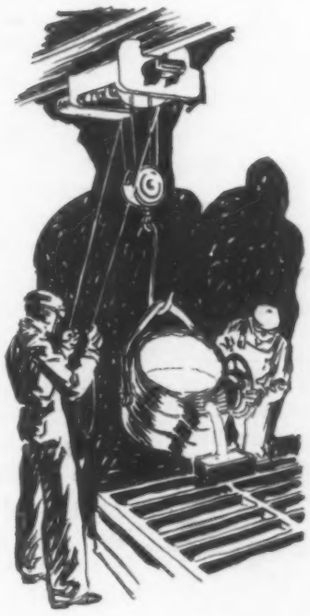
Recently the Japanese Government works, at the suggestion of a trading company which buys scrap for its account agreed to accept automobile grade of heavy melting steel as furnished to certain American mills. When the shipment arrived in Japan, inspection by the steel company developed that the material was badly prepared, alloy steel having been included and many pieces contained parts of babbitt and other non-ferrous metals. The entire cargo was rejected and the works refused to accept further shipments of this grade.

The accompanying photographs of barge loads of

(*Concluded on page* 131)

Continuous Electric Melting and Other Gray Iron Practice

CONTINUOUS melting of gray iron from cold stock in the electric furnace and also the briquetting of borings were two important topics at one of the sessions of the Cleveland convention of the American Foundrymen's Association in May.



Gray Iron Flows Continuously from Electric Furnace

FLOOR space is used a number of times during each day, production per floor is increased and investment in molding equipment is lowered at the plant of the Beach Foundry, Ltd., Ottawa, Canada, where for the past 21 months a 3-ton electric furnace has produced a continuous flow of iron from which stove parts are made. An outline of practices and results was given in a paper by N. L. Turner, metallurgist for the Beach foundry.

Production has been increased 25 to 30 per cent without sand-conveying equipment and when working only one shift a day. The cost of iron at the spout is less than previously obtained with the cupola. Flexibility of the method has aided in coping with rush orders. The electric furnace handles charges which could be melted only in the cupola with comparatively heavy losses. Pig iron is no longer used, cast iron borings and steel clippings with necessary additions of ferrosilicon, ferrophosphorus and ferromanganese being the materials which are charged into the electric furnace.

Cost of Electric Iron Per Ton

A brief review of the cost of producing a ton of iron is as follows:

Raw materials	$11.25
Additions, ferroalloys, coke	1.07
Labor	1.14
Power	5.25
Electrodes	2.09
Refractories	0.60
Water	0.11
Laboratory	0.50
Interest on investment, depreciation	0.57
Melting loss	1.13
Total	$23.71

Power is purchased at 11,000 volts, on a flat-rate basis of $23, less 10 per cent and 5 per cent, per horsepower per year. However, when operating under capacity, the following rates apply:

	Per Hp. Per Month
Service charge	0.8c.
First 50 kw. used in month	1.3c.
Second 50 kw. used in month	0.9c.
Remainder of kw. used in month	0.12c.

To maintain continuity of operations, an initial bath of iron must be built before the continuous charging and tapping take place. After the last iron is tapped the bottom is patched and the first charge, consisting of gangway pig, foundry returns, stove plate scrap, cast iron borings and steel clippings, is charged. This charge, about three tons, is melted down. The furnace is then slagged off and borings are fed until full bath has been built up. A test bar is poured and an analysis is made on completion of the melt-down of the original bath. After tapping, a feed charge is placed in the furnace. This operation of tapping and feeding is continued throughout the day's cast.

Analysis of the Stove Plate Iron

Feed charges consist of foundry returns and stove plate scrap which do not require the addition of ferroalloys. Each charge approximates 1100 lb., which will melt down and reach the pouring temperature, about 2700 deg. Fahr., in 15 to 30 min., depending upon the power input.

Analysis of this stove plate gray iron is as follows:

	Per Cent
Carbon	3.25 to 3.35
Silicon	2.75 to 2.85
Phosphorus	0.60 to 0.70
Manganese	0.45 to 0.60
Sulphur	Less than 0.09

It has been found necessary to keep the silicon content higher than in cupola practice. During the day there is a slight increase in silicon, which is controlled by the addition of cast iron borings.

The roof of this electric furnace, used in the manner described, has a life of about 650 tons, whereas the lining is serviceable for 850 tons.

Cast Iron Briquettes With No Binder

A METHOD of briquetting cast iron borings to a density of 70 to 85 per cent, without the use of a binder, was described by Harry Rayner, foundry metallurgist, Dodge Brothers Corporation, division of the Chrysler Corporation, Detroit. Each briquette is 4 in. in diameter by 3 to 5 in. thick and weighs from 7 to 10 lb.

A small experimental cupola of 18-in. diameter, charged with 273 lb. of briquettes, resulted in pigging 259 lb., the loss being 14 lb., or 5.1 per cent. Heats

containing briquettes have been melted in large cupolas and similar results were obtained as to losses and the properties of the castings were satisfactory.

In regular practice no difficulty has been encountered in using briquettes to the extent of 25 per cent of the charge. The following mixture has been found entirely acceptable:

	Per Cent
Steel	20
Pig iron	35 to 55
Remelt, gates and sprues	15 to 25
Briquettes	15 to 25

When melting mixtures high in scrap constant care must be used in keeping the bed high in the cupola. It must be known that the mixture will absorb the additional scrap. It is advisable to make sure that the source of borings is known. Also it is good practice to use automobile cast scrap as soon as the cost of briquettes equals that of scrap and this grade of scrap keeps below the price of pig iron.

Total cost of briquetting, including overhead, is about $3.25 a net ton. If borings cost $7.60 a net ton, then the total cost of the briquettes would be $10.85 a net ton. The saving is at once apparent when compared with pig iron at $18 a net ton or automobile cast scrap at $19 a net ton. Dodge Brothers charged 14,226.4 tons of briquettes in 1928 at a saving of $101,718.76. Discussion disclosed that a loss of 10 per cent in the weight of briquettes results from handling. This wastage may be swept up and rebriquetted.

Some Cupola Problems

ONE session, presided over by R. S. MacPherran, assisted by J. T. Mackenzie and F. J. Walls, covered materials going into the cupola, cupola operation, and materials coming from the cupola. The chairman stressed the importance of studying the effect of the air blown into the cupola, the desirability of having this dry, of keeping the volume constant and in best suiting the amount to the effective melting rate of the cupola.

Mr. Walls took up the question of running a cupola heat, reading the report of his committee on the proper method of running a heat in a 54-in. cupola, as a concrete example of how a cupola should be handled, from making bottom to the actual melting of the iron. In a spirited debate it was stressed that prime consideration should be the actual weight of oxygen introduced into the cupola rather than the volume, the pressures involved being practically immaterial.

Another point given considerable attention in the debate was that it was entirely possible to force the cupola to extremely high melting rates by simply increasing the blast volume and height of bed to correspond; but that this was not good policy in view of the chances taken that things might go wrong during the heat.

ANOTHER session was devoted to the discussion of gates and risers, under the chairmanship of H. W. Dietert. E. M. Handley presented formulas used in his foundry to determine gate areas and disposition, to get the desired pouring speeds, etc.

Foundry Nomenclature Confused

Lack of a fixed nomenclature of foundry terms connected with a finished mold was taken up by Eugene Smith. The terms "sprue" and "gate" were applied interchangeably. Runners, pouring heads or basins, in-gates, down-gates, risers, etc., should be applied to the same parts of the mold by every foundryman. This was applauded by all those present and Mr. Dietert called for a committee of volunteers to go about standardizing the nomenclature in question.

Discussion then proceeded in an animated manner and indicated a wide divergence in gating practice.

Alloy Iron and Heat Treatment

HIGH-TEST cast iron, alloy additions and heat treatment were discussed under the chairmanship of H. Bornstein, assisted by F. B. Coyle.

Before going into these questions, T. J. Jennings discussed the subject of chromium in cast iron mixtures, and described his method of using it for mining machinery castings. His experience in finding chromium in high percentages useful for fluidity purposes was, however, not shared by the chairman, whose experience was the other way.

The chairman outlined the subjects to be discussed. So far as strength was concerned, he felt it safer to aim for the lower ranges of high-test cast iron, meaning thereby irons of 40,000 lb. per sq. in. and over, rather than the extreme values such as 70,000 lb. per sq. in. On the point of test bars he had found that while good strengths could be had from them, the iron in the castings made might be very much weaker.

High-test cast iron processes are of three varieties: High steel percentages in cupola melting, with the ferroalloys added to the charges; alloys made as ladle additions; duplexing cupola metal in the electric furnaces.

Heat Treatment Is Threefold

Heat treatment of cast iron was next discussed by the chairman. This can be threefold: To remove stresses only, by heating up to 950 deg. Fahr.; to remove both stresses and change the microstructure by heating between 1200 and 1600 deg. Fahr.; lastly, to heat up to the critical point (1550 deg. Fahr.) and quenching in oil; this gives a fine structure, but hardens the metal considerably.

F. B. Coyle discussed nickel additions to cast irons of the high-test varieties, which by special heat treatment had been brought up to 100,000 lb. per sq. in., and over. Doctors Moldenke and Meyer discussed the behavior of carbon in making these high-grade irons, and the melting practice necessary to get the high temperatures of superheat required in the cupola, as well as the extension of time at lower heat ranges in the case of the air furnace. The formation and effect of the graphite "nuclei" present in iron, as melted ordinarily, were explained, so that the subject matter under discussion could be understood by all present.

An extended description of the actual production of exceptionally strong iron for castings up to 55 tons was made by Mr. MacPherran. Others present mentioned the making of castings of similar strength not over ⅛ in. thick, which incidentally could be readily machined. In general, however, high-test cast iron is harder than ordinary iron, does not machine as readily, and is good when carefully made. Unless, however, the best of melting practice is used, the results become very discouraging.

Battelle Institute Houses Several Metallurgical Researches

BATTELLE Memorial Institute building in Columbus has been completed hardly a year, yet the organization is already functioning actively on ten major investigations; men and materials are being assembled for two others; and still others are in the formative stages approaching the closure state. The rapidity with which the volume of activities has increased is a measure of the interest of the metallurgical industry in research generally and an augury for the future importance of Battelle as a research center.

A word about the formation of this newest research institute might not be amiss. It was established by the will of Gordon Battelle, whose untimely death in 1923 extinguished one branch of a family of Ohio pioneers, long connected with the coal and iron industry in Cincinnati, Piqua and Columbus. Mr. Battelle was a man of inquisitive temperament, interested in many phases of metallurgy, with a lively appreciation of the value of industrial research, and with a public spirit which impelled him to return to the metal and fuel industries much of the wealth which his family had gained therefrom.

In accordance with his will the institute has been established as a non-profit agency. It has endowment funds ample for the upkeep of the building, the maintenance of a general staff, the employment of a sufficient number of high-grade men to supervise work in various lines of science and to pay for the conduct of a considerable amount of fundamental research. The modern building already available, however, has far larger capacity than this, and the surplus space is to be devoted to cooperative investigations on fuels and metals as such shall be needed and sponsored by industries or individual firms.

Dr. H. W. Gillett (for 17 years with the Bureau of Mines and the Bureau of Standards) assumed active direction upon completion of the building about a year ago. Under him as associate directors are C. E. Williams, supervising work on fuels, ores, smelting—that is, raw material and its preparation—and, as of July 1, Dr. O. E. Harder, who will direct work on metals, alloys and studies of their properties. Each research in progress at the Battelle Memorial Institute will be supervised by one of these men, although it is intended that each study shall be cooperative in the sense that any member of the staff may and is expected to contribute of his specialty toward its solution. For that reason adequate provision in general physics and chemistry has been made, as well as the more usual general departments such as library, instrument shops, and the administrative, accounting, and general services.

Those projects already under way indicate that the Battelle Memorial Institute will be a very good place for special investigations sponsored by corporations or industrial groups which have adequate plant control laboratories, a lively appreciation of the value of research, a distinct feeling that a certain problem should be investigated, but without the research laboratory facilities or staff which would be competent to attack such a generalized problem. Rather than go to the very considerable expense and delay of establishing such a laboratory of their own, they will find at Battelle Memorial Institute a well-equipped building and facilities available to them at unusually low cost where work can be prosecuted under adequate and sympathetic direction with the best prospect of success.

When such projects are developed a contract is entered into between institute and sponsor, outlining the nature of the investigation and providing for the

appointment and payment of one or more "sponsor's representatives." In addition to the salary of such representatives the sponsor pays an agreed amount for supervision by the general staff. While the amounts are variable within certain limits, depending upon the payment required for an adequate investigator, it appears that, on a project requiring one experienced investigator full time, and the cooperation of several experts of the institute staff, it will cost the sponsor in the neighborhood of $6,000 a year for the representative's salary, for supervision by the institute staff, and for light, heat, general services and similar expenses. Supplies, special apparatus, travel and such incidental expenses incurred solely by the sponsor's representative are paid for by the sponsor at cost without overhead.

It can be seen that such plans visualize the employment of men of considerable background, experience and ability for conducting cooperative research. For this reason, the plan is much superior to that of undertaking researches in most institutions of university grade, where the work is ordinarily done by fellows on part time, interrupted by the work necessary to prepare the investigators for advanced degrees in the graduate school—which, in fact, is the principal business of the research fellow.

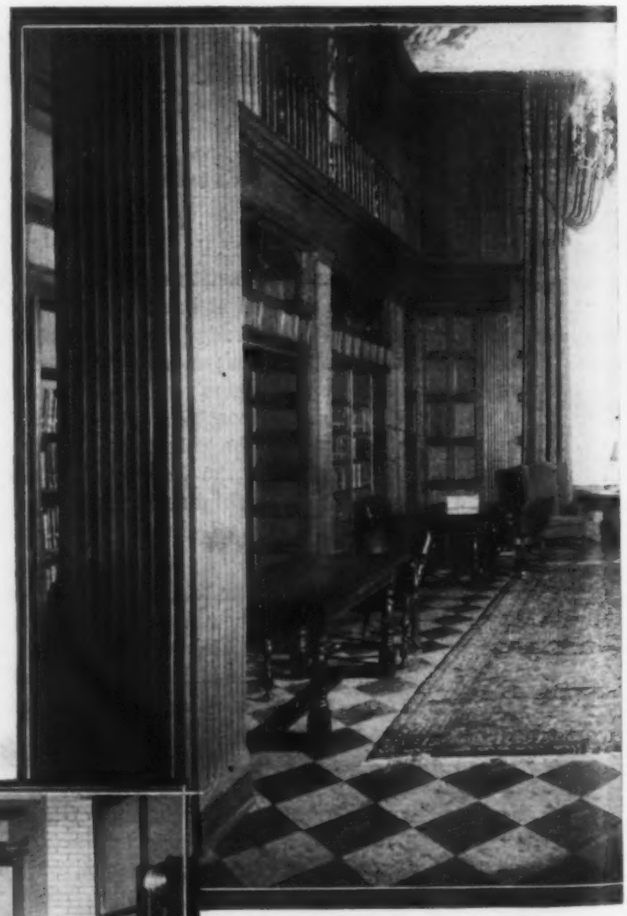
Workers at the Battelle Memorial Institute will be men who have already attained such graduate and post-graduate education as is necessary, together with a few years of plant experience, laboratory control work, or intensive investigation. The director reports that there is an adequate supply of men of this caliber who will become available for work in Columbus as soon as definite propositions of employment can be made to them.

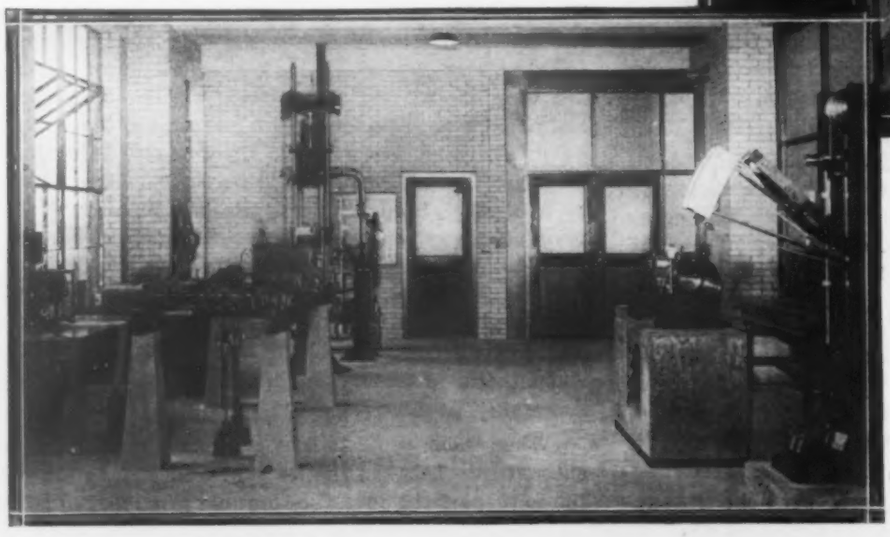
Likewise, Battelle is not restricted by such matters of public policy as require publication of the results of the investigations made in governmental laboratories and prevent issuance of adequate patent protection of valuable findings.

The L-shaped building shown in one of the illustrations is erected on the outskirts of residential Columbus. It faces the broad acres of Ohio State University's farm, and to the left, across a public park, is a winding creek. Sufficient ground at the rear is owned to prevent encroachment and to provide amply for future expansion. Its proximity to the university has already been found to be highly advantageous in the interchange of library facilities, consultative advice between staff and faculty, and occasional use of specialized, expensive apparatus.

The main floor center is occupied by executive and business offices. The near corner is devoted to a beautiful library, whose main hall extends through to the second floor. Similar space on the opposite side of the entrance is devoted to an auditorium, equipped with such modern appurtenances as sound-absorptive walls and ceilings, aluminum chairs, and a concealed projection room.

The rear portion of the L contains an industrial laboratory 130 ft. long and 30 ft. wide, extending from the basement up to a ceiling 36 ft. overhead. It is served by a 5-ton traveling crane; this main craneway is flanked at one end and along one side by broad balconies at the main and second floor levels, where investigations on a



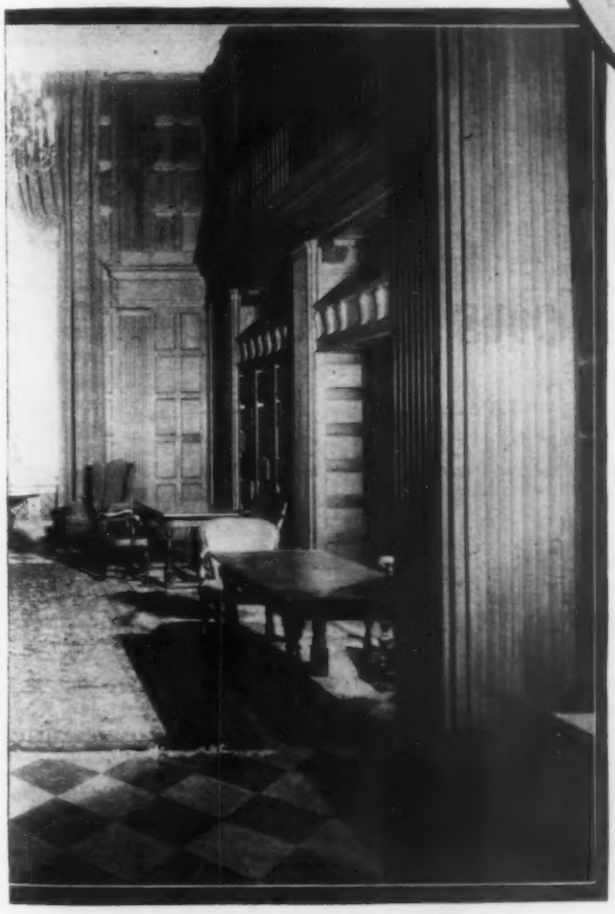


READING Room of Library Is Beautifully Furnished. Book stacks occupy rooms to left, on both first and second floors. On the other side is a periodical room and alcoves for special collections

semi-commercial scale which require moderate head-room can be located. They also contain the general equipment for physical testing, and the heat-treating laboratory.

Second floor front and all of the third floor are occupied by laboratories for individual researchers, similar to the one illustrated, and larger quarters for a general physical laboratory and a general chemical laboratory. Furniture in each room, as well as the general services (such as air, gas, electricity, water), are carefully standardized so as to be adaptable to almost any work which will be undertaken, once the specialized equipment is installed.

In the basement under the front wing is a constant temperature room, an instrument makers' shop, a carpenter shop, a book bindery, and the storage rooms for chemicals and supplies.



MANY Laboratories for Individual Research Are Furnished as Shown on the Corner of this Page with Hood, Sink, Work Tables, Desk and Cupboards. They are provided with ample services of air, water, gas and electricity, and are ready for installation of special equipment as required for the studies in progress

▼ ▼ ▼

View at left is of a group of physical testing machines on a gallery adjoining main industrial laboratory

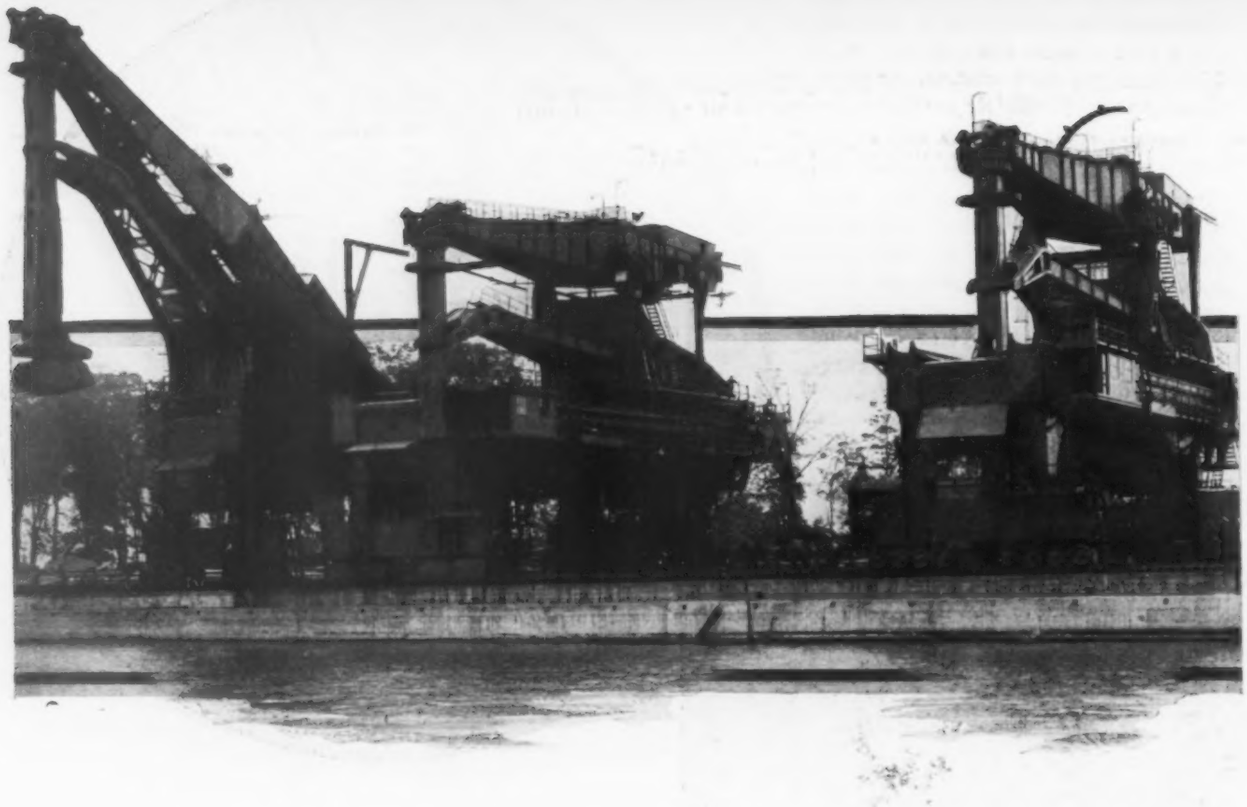
The location of the building in a strictly residential district avoids the earth tremors set up by heavy traffic and heavy manufacturing. In order that the institute's own machinery—such as feed water pumps, air-conditioning fans, metal and wood-working tools, and even high-speed testing machinery—will never interfere with the delicate balance of scientific equipment of high precision, they rest on thick cork slabs placed between them and the massive foundations, the latter further separated from the floor by channels filled with asphalt mastic.

The advantages above outlined have already encouraged several industrial organizations to finance investigations under the institute's supervision. Three of these have been under way for some time—namely, Reynolds Metals Co. on the properties and uses of metal foil, Federal Mogul Corporation on journal bearings for severe duty, and Worthington Pump & Machinery Corporation on the properties of cast iron at high temperature—while a fourth (a study of the beneficiation of iron ore, sponsored by Oglebay, Norton Co., M. A. Hanna Co., Wheeling Steel Corporation and the American Rolling Mill Co., is getting under way, although it bids fair to eclipse the others in its extent.

Work on the embrittlement of structural steel in galvanizing is also getting under way for the Utilities Research Commission.

Researches undertaken with the Memorial funds include the following: Library work for Alloys of Iron Research on alloys of the molybdenum group and on iron-carbon alloys; properties of aircraft materials (such as corrosion-resistant stream-line wires) at

(*Concluded on page* 131)



To Unload 3600 Tons of Ore an Hour at Presque Isle

CEREMONIES incident to the starting of three huge Wellman stiff-leg all-electric ore unloaders commenced when the freighter Joseph Wood, with her cargo of 9500 tons of ore, arrived at the new docks of the Hocking division of the Chesapeake & Ohio Railroad Co., Presque Isle, Toledo, Ohio, on June 5. One picture shows the three machines dipping into the ship's hold, and emerging with 17 tons of ore for each bite.

These new docks are approximately three miles nearer the lake than the docks on the river at Toledo. They permit docking and undocking the largest boats without the aid of tugs, thus eliminating six miles of river movement, with the attendant river hazards, drawbridges and low water.

Unload Ore Directly from Boats into Railroad Cars

These three unloaders, which take the ore directly from the vessels to cars, run on tracks spaced 72 ft. 6 in. apart, each track consisting of a pair of rails 24 in. center to center, and with the forward track center 5 ft. 6 in. from the face of the dock. They are designed to excavate from ore-carrying boats of typical sections and of beams up to 65 ft. The ore is loaded directly into railroad cars standing on any of the four tracks inside of the span, through the disk hoppers and by means of traveling scale larry cars.

Each unloader consists of two parts—the main frame with cantilever, which traverses the dock, and the traveling trolley with bucket, on top of the main frame. In operation the bucket excavates from the boat and dumps the ore into a disk hopper between the main girders at the forward end. The ore is discharged from the disk hopper into a traveling scale larry car, which carries and deposits the ore into the railroad cars.

Drive Is by Gearing and Shafting

Front and rear legs of each unloader are mounted on two four-wheel equalized-drive trucks at each end of the sills, and an additional four-wheel spring truck at the center of the rear sill. The drive trucks are mounted in pairs, and all wheels on the drive trucks are connected to the moving motor through spur and bevel gearing and line shafting.

The disk hopper, located at the forward end of each machine, has a capacity of 50 tons. Its dimensions are such that the bucket may dump into it rapidly, without spilling. It is mounted on rollers, to allow moving it to the rear of the machine. This permits the bucket leg to pass through between the main girders, making it possible to lower the bucket to the

ground for repairs. The bottom of the hopper consists of two revolving disks, driven through gear rings, bevel and spur gearing by a motor at the rear of the frame.

Each machine has a traveling scale larry of 40 tons capacity, mounted on horizontal track suspended from the main girder and extending from the front leg to the rear end of the cantilever. Mechanism for traversing the larry is mounted at the rear end of the scale larry.

The hopper is suspended from the main frame by scales having registering and recording beams placed in the cab, in the front part of the main frame. The gates are operated through connecting rods, spur gearing and a worm unit by a motor mounted at the rear of the hopper extension frame.

Speeds Give Capacity for 1200 Tons Hourly for Each Machine

The trolley with its bucket is designed to make one trip in 50 sec., with 17 tons of ore. This results in an excavating capacity of approximately 1200 tons an hour for each machine. Travel is at approximately 50 to 75 ft. a minute. The bucket leg is designed for a total movement of 1⅝ r.p.m.

These are the first unloaders to be operated by alternating current. The two main motions—beam hoist and the trolley travel—are operated by direct current, variable-voltage control, and the rest of the motions straight a. c., with full magnetic controllers.

There are eight motors on each unloader, with a total of 1060 hp. The 3-phase, 60-cycle transformer station is designed for an incoming line current of 6600 volts and an outgoing current of 440 volts.

Trend of Electric Welding in Buildings

Electric arc welding in building work is trending toward the use of higher currents and automatic welding machines, according to Dr. Frank P. McKibben, consulting engineer for the General Electric Co. In a paper read before the World Power Conference in Berlin, he said that although for ordinary shop buildings the steel is welded by hand, with currents from about 175 to 200 amperes for ⅜-in. fillets, there is a distinct trend to use machine welding where long lines of welds are used. For hand arc welding, uncoated medium steel electrodes with carbon content of from 0.0013 to 0.0018 are used almost universally. Steel should not be painted before welding, but be given one coat of linseed oil after the shop welding is performed, painting following the field welding.

The Three Machines Have Combined Unloading Capacity of 3600 Tons an Hour. Each unloader takes a 17-ton bite of ore (below) from the hold every 50 sec.

Wider Use of the Soderberg Self-Baking Electrode

BY JAMES SILBERSTEIN*

THE first commercial self-baking Soderberg electrode was installed in a ferrosilion furnace in Norway in 1919. The electrode proved a success and at present there are a great many in operation. A Soderberg electrode is molded to shape by ramming soft preheated carbon paste into a cylindrical sheet steel container to which the electric current is led through a series of water-cooled bronze contact clamps. The contact area between these clamps and the electrode is very much larger than that of ordinary carbon electrodes since the unbaked paste has a poor electrical conductivity. The paste is transported in blocks, which are given a shape so as to fit the heating boxes of different users. Except when paste is being rammed into the electrode or a new sheet steel container put on, the electrode must be covered with a cover, since otherwise dust and dirt will accumulate on the paste and a subsequent breakage of the electrode is likely to occur.

When the electrode is installed, the furnace must be run only with coke for a certain length of time, generally from 8 to 10 hr., and at a low electrical load in order to bake the lowest part, about 1½ to 2 ft. of the electrode. After this is done the furnace can be run continuously at full load and with regular charge, the only heat required for baking more of the electrode being that which is ordinarily lost by conduction.

Care should be taken not to charge any ore against the part of the electrode which is not baked, since this results in subsequent corrosion of the electrode. After baking, the Soderberg electrode corresponds to amorphous carbon electrodes, both with regard to electric current carrying capacity and chemical action upon metals, ores and slags. The Soderberg electrode has, however, one advantage over other electrodes: It shows practically no air corrosion because it is protected by the sheet steel container. This advantage is very important. Previous to the development of the Soderberg electrode, attempts were made to protect electrodes from air corrosion by applying coatings of asbestos or other refractory materials mixed with water glass or by fitting a casing on the electrode.

Neither method was satisfactory, the coatings broke off easily and the steel casing could in actual practice never be fitted absolutely tight to the electrode, so that consequently hot air from the furnace passed through the space between casing and electrode as through a chimney, oxidizing the electrode on its way up much more than if there had been no "protective" casing.

When the Soderberg electrode has burnt down to such an extent that it is necessary to lengthen it, another sheet steel cylinder is welded on top of the old one and carbon paste rammed into it. This is performed while full current is on. The slipping of the electrode in the holder can also be performed at full current by simply loosening some of the screws in the holder until the electrode slides down by its own weight. Ordinarily the electrode is slipped from 6 to 8 in. Care must be taken in loosening the screws; if they are loosened too much, the electrode may slip too far and subsequent breakage is likely to occur. If the operating crew has had no experience in using Soderberg electrodes, it is, therefore, good policy to slip the electrode while the current is off. If the electrode slips too far, the furnace should be run below normal load to avoid breakage.

Savings from using the Soderberg electrode are due to the absence of butts and to less air corrosion of the electrode. These savings are largest for furnaces producing calcium carbide and ferroalloys, and the first installations of Soderberg electrodes were therefore in such furnaces.

There are installations in steel furnaces having a capacity of 4 to 5 tons, and the diameter of the electrodes, of which there are generally three to a furnace, ranges from 13 to 16 in. Other electrodes are installed in 20-ton furnaces, the diameter of the electrodes ranging from 20 to 24 in. Such installations have been made in France, Germany, Norway and Italy in furnaces producing cast steel and alloy steels.

*Metallurgist, 4219 West End Avenue, Chicago.

Loading Crated Goods to Avoid Displacement and Crushing of Contents

HEAVY freight rates and the boosting of minimum carloads to higher and higher figures formed a problem which the Buck Stove & Range Co., St. Louis, believes it has solved. A way had to be found to pack each freight car to the roof, with ranges or stoves tier-on-tier, so protected that they could not shift or chafe or otherwise suffer from the shocks of shunting or the swinging and swaying of the car in transit.

The subject was studied closely by the traffic men. At first more wood bracing was suggested, and was used for a time. But it was unsatisfactory and expensive. Bulk-binding with Signode steel strapping was then suggested and tried, and has now been adopted as standard practice.

Much wood bracing was eliminated—as much as 600 lb. to the car in some instances. This also resulted in a reduced freight bill by just that much. The illustrations show the method of loading and tying.

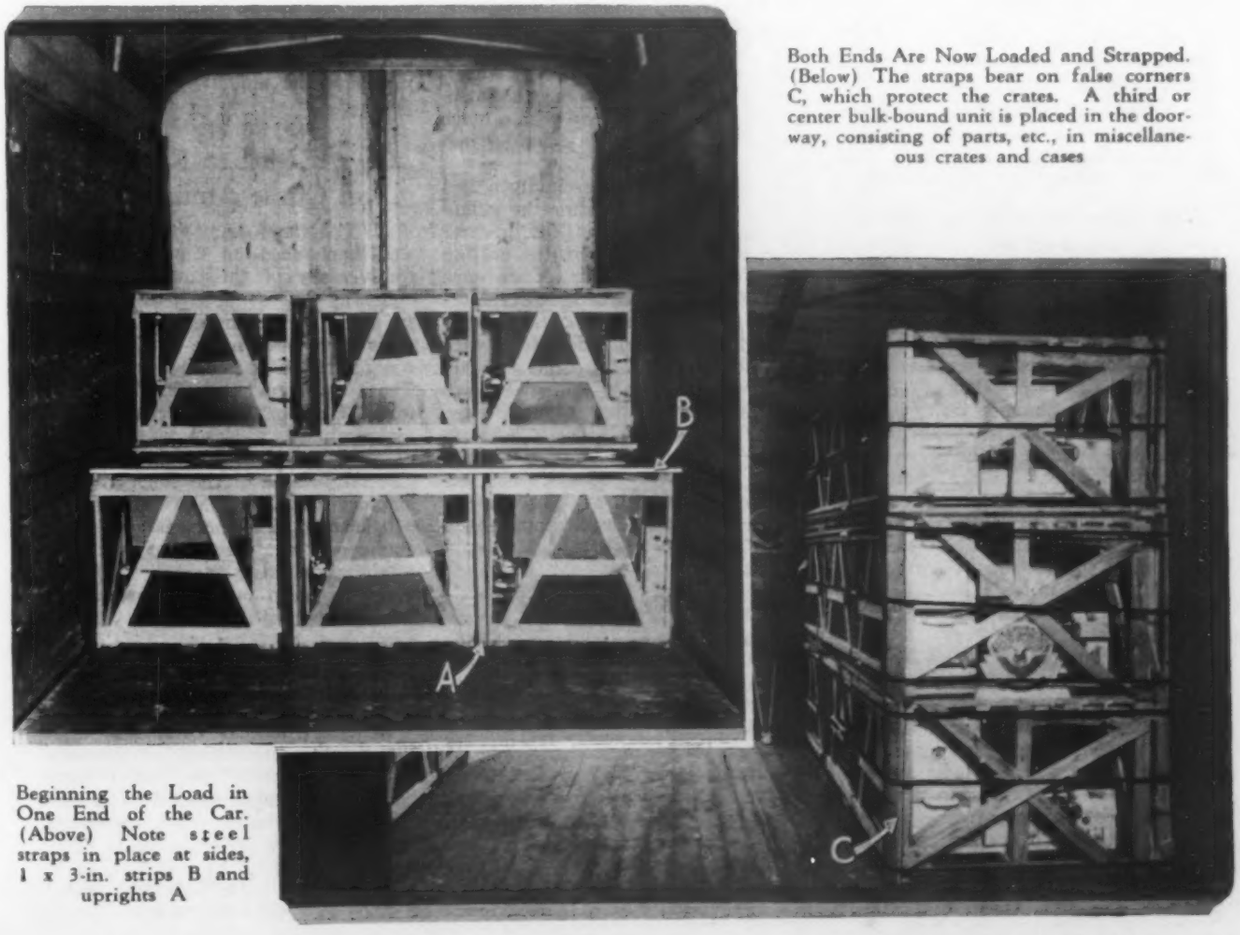
Crated ranges are loaded three high; the first picture was taken when only the second tier was reached. Strapping is fastened just in front of each crate in the end row, in the rear of the car. Two bands are used for each row, unless the car contains very heavy stoves, in which case three bands to the row are used.

Two straps to each tier are secured to the walls of the car on a level with the wood strips on the tops and bottoms of the crates, these being the most rigid parts of the crates.

Stove loading is then begun. Two 1 x 3-in. strips of common lumber (B) are nailed across the tops of each row of crates, near the front and rear of each row. This holds the ranges in place and at the same time makes a good footing for the row next above.

When very heavy stoves are loaded three tiers high, there will be considerable weight to be held up by the bottom tier. To relieve this, 2 x 4-in. common lumber uprights (A) are placed immediately below the two 1 x 3-in. strips that run across the tops, and are nailed into position.

After the units are completed in both ends of the car they are ready for tying. False corners (C) made



Beginning the Load in One End of the Car. (Above) Note steel straps in place at sides, 1 x 3-in. strips B and uprights A

Both Ends Are Now Loaded and Strapped. (Below) The straps bear on false corners C, which protect the crates. A third or center bulk-bound unit is placed in the doorway, consisting of parts, etc., in miscellaneous crates and cases

of 1 x 4-in. elm lumber (rough) are used in front of the units. This elm lumber is used because it does not mush. The straps are then hung for the third unit, which is placed in the doorway.

If there is a bad mixture of parts, and the like, in this unit or section, some wood is used to fill out open spaces. The loading clerk takes care of this very easily. The unit is then tied and the car is ready to move.

There were 110 stoves loaded in the car from which the pictures were obtained. For that reason three bands were eventually used. The saving of lumber noted above was accomplished by eliminating a 2 x 4-in. piece of lumber heretofore used across the center of each row of stoves throughout the entire loading of the cars. By eliminating these 2 x 4's, more stoves can be loaded into a car, since there is considerable space thereby saved.

Grinding Tungsten-Carbide Tools

Precautions Necessary for Best Results with the Cemented Tungsten-Carbide Edge—Frequent Light Grinds Desirable

TO procure economically a clean, sharp edge, correct rakes and angles, without undercutting the cutting edge and without checking or cracking the tip of the tool, is the main problem in grinding or regrinding tools tipped with tungsten carbide. What follows is taken from a pamphlet issued by the Carborundum Co., Niagara Falls, N. Y., relating to this matter.

As the material is different in nature from high-speed steel, it requires different methods and a different technique of handling. It is very hard compared with other materials. It tends to chip easily on the finished edge during grinding.

The sharpness of the cutting edge is most important in relation to the efficiency and productivity of tools made from it. Hence special grinding wheels, different from those in common use in tool rooms, special devices and methods of feeding and more care throughout are required.

Two Materials Must Be Ground Together

As the material lacks shear strength and ductility, it has no tendency to bend under stress, but will break easily. Therefore it is not built into solid tools but a small piece is fixed or inserted in a steel shank. This is done in such a manner that the cemented tungsten carbide is supported by the steel and the cutting edge is of the hard material. Since cemented tungsten carbide has an extremely high compressive strength, the stress is not absorbed by it but is passed on to the steel shank. Thus, tools tipped with this material are made larger in cross-section than the ordinary high-speed steel tool.

This construction of the tool makes the grinding problem more difficult because the two metals, having different properties, must nevertheless be ground at the same time and on the same grinding wheel. Many factors and variables enter into the problem of selection of proper grinding wheels for this super-hard cutting material.

The pamphlet goes on to discuss in detail characteristics of the work to be done, the size, speed and other particulars of the grinding wheel, the machine on which the operation is performed and the character of the operator. A few of the points brought out appear in the following:

Inter-Action Between Wheel and Tool Being Ground

As the hardness of the tungsten carbide material lies very close to that of the abrasive used in the wheel, there is a tendency for the wheel to become glazed very quickly, especially if it is a little too hard. Frequent dressing of the wheel therefore becomes important. The amount of stock to be removed from the nose of the tool largely affects the grinding wheel action. Where comparatively large amounts must be ground off, coarse grits and hard grades of wheels must be used. In this case a finishing grind should be made with a much finer wheel, particularly if hand-grinding is employed.

In general, the more rigidly a tool is held or fixed, the softer the grinding wheel can be and the greater keenness will be made in the cutting edge of the tool. Pressure of the work against the wheel is of special importance. High pressure causes rapid wheel wear and excessive heat, with no faster removal of stock.

Large-diameter grinding wheels give cooler action and permit the use of harder wheels. Wheels perform harder at high speeds than at low speeds. Excessive speeds are not recommended because of this harder grinding action, the recommended range being from 4000 to 5500 surface ft. a minute.

A Job for a Specialist

Regrinding of tungsten-carbide tools should be done in centralized tool rooms by men who do little else. They should be supplied with high-powered magnifying glasses or microscopes to permit examination of the cutting edge of every tool to be reground. This is because the condition of the cutting edge is of such great importance and has such a large bearing upon satisfactory performance in use.

On production jobs it is good practice to grind the tools on a definite schedule. This may be based on hours of service or number of pieces machined. It has been found that production rates frequently can be greatly increased by grinding the tools more often, and speeding up the machines in which they are used. Factors such as time for setup, time of grinding and increase in machine speeds must be studied, to determine just how often the tools should be ground.

Frequent honing or stoning of the cutting edge without removing the tool from the setup is recommended. This removes small particles of metal clinging to the cutting edge, and causes it to present a clean surface and sharp edge. For this reason it increases the life of the tool between grinds, and so saves both in the grinding time and in the setup time of the tool.

Research Building Under Construction

An engineering and research building of seven stories, now under construction, will house the development work of A. O. Smith Corporation, Milwaukee. Eventually, 1000 men, carefully selected research engineers and scientists, will carry on this work of invention and discovery.

This research staff already records among its achievements the development of the revolutionary pipe mills, automatic frame plant and the welding plants of the corporation, as well as many contributions to the scientific information and working principles of the industries the company serves.

Gives Stock to Employees on Crane Anniversary

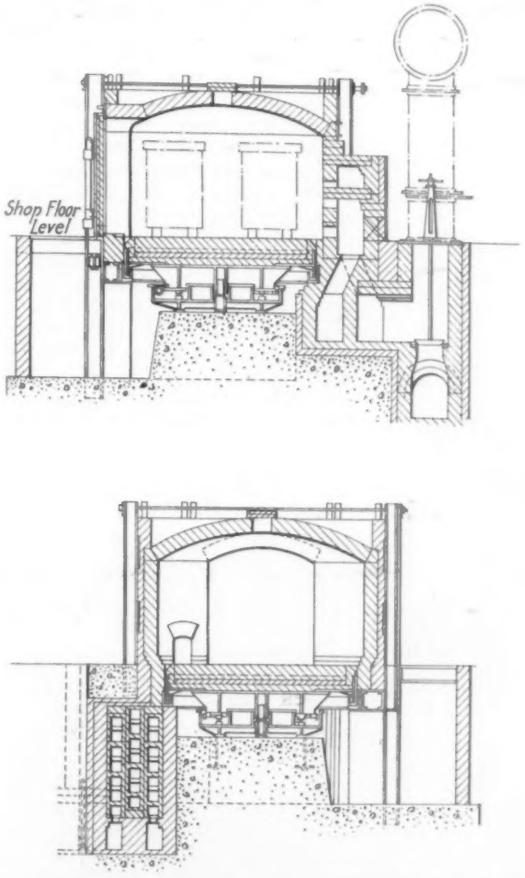
R. T. Crane, Jr., president, Crane Co., announced on the seventy-fifth anniversary of the founding of the company a personal gift of $4,000,000 in stock to employees. Three such gifts have been made by Mr. Crane out of his stock holdings since 1926. These were made at Christmas time in 1926, again at Christmas in 1928 and again this week on the observance of the anniversary of the company. The total value of the stock given to employees by Mr. Crane is more than $10,000,000. The present gift is to employees who have been with the company ten years or more, ten shares going to each man and woman with ten years' continuous service and one additional share for each year of service over ten years.

General American Tank Car Corporation is now producing for the Aeronautics Division of the United States Navy Department special tank cars which will be used for transporting helium gas from the Amarillo, Tex., fields to the naval base at Lakehurst, N. J. Each tank car will weigh 200,000 lb.

Rotary-Hearth Furnace for Annealing

Recuperative Heating by Gas in Controlled Atmosphere Gives High Operating Efficiency and Uniform Product

MOTOR-DRIVEN furnaces having rotating hearths have been installed in many English plants for open or box annealing or for carburizing by Kingtaudevin & Gregson of Sheffield, England. This design is now being introduced into the United States by H. L. Dixon Co., Pittsburgh, and it is claimed that the port arrangement, use of recuperators and of gas and air control will effect a low fuel consumption even when a definitely reducing atmosphere is maintained.



SECTIONS Through Rotary-Hearth Furnace, Taken at Right Angles to Each Other. Inside diameter of walls is 11 ft. 3 in. and walls are 13½ in. thick. Table is 10 ft. 3 in. in diameter

The general conditions obtaining in this furnace are said to be such that uniform annealing and a definite acceleration and gradient of temperature may be accomplished. The furnace is well suited for open annealing of a variety of materials. In the reducing atmosphere the life of the pots is said to be increased at least six times, and the usual scale that appears on annealing pots is replaced by a red "bloom." Under average working conditions a uniform heating throughout the pots is consistently maintained. The furnace is generally designed for producer gas fuel, although the port construction may be modified for the use of natural gas, oil or tar.

Air for combustion first passes through recuperators beneath the floor level, where it is heated by the waste gases on the counter-current principle. This hot air passes into mixing chamber where it meets the hot gas, and partial combustion extends into the furnace. Some air is bypassed into the furnace from the recuperators, thus completing combustion in the furnace. The products of combustion are directed across the furnace, where they make contact with the pots containing the materials to be treated, and a swirling atmosphere is set up as the gases are carried around the chamber. Waste gases are carried from the furnace chamber into the recuperators and thence to the chimney.

The furnace chamber itself is circular in plan, as shown by the drawing, and of a dimension that depends upon the capacity required. The hearth is built on a heavy casting, and floored with fire brick laid on insulating material.

This whole movable unit is carried upon an iron base plate by means of a ball race. The hearth and bed plate castings are of such a design as to form an oil chamber in which the whole ball race is immersed. A gudgeon or king-pin maintains the rotating hearth in its central position and prevents any side thrust on the ball race. Rotation of the hearth is effected by means of a circular rack fitted around its periphery, engaging a worm gear. In order to protect the mechanical parts of the rotating table from the atmosphere of the furnaces and also to prevent the infiltration of any air into the furnace chamber, the circumference of the hearth has a lip projecting into a sand seal.

While the fuel consumption varies with the heating cycle and temperature, which in turn varies with the class of material treated, about 225 lb. of coal per gross ton of steel, not including boxes, is an average figure for English practice, when operating under normal conditions and with a reducing atmosphere.

College Seniors Undertake Business Researches

How new research facilities are being mobilized for the benefit of New England business by the New England Council is the story behind a novel cooperative experiment engaged in by the council's industrial committee and the engineering administration faculty of Massachusetts Institute of Technology, as a result of which some 25 senior students were this year put to work studying practical business questions posed by the council.

Specific research projects were proposed and the idea was immediately taken up by Massachusetts Institute of Technology, and an organized response to the council's suggestion was arranged. Twenty-five seniors in the engineering administration classes of Prof. Erwin H. Schell were assigned to research problems named by the council's industrial committee, of which Frederick H. Payne, now Assistant Secretary of War, was then chairman, and Ray M. Hudson is secretary. Individual students in other institutions, including Harvard, Dartmouth and Boston University, also conducted thesis researches along lines embraced in the council's suggestions.

Application of modern marketing methods in New England industries, methods of eliminating seasonal variations in the motor boat industry, methods of controlling quality in metals manufacturing, steam power losses and cost control systems were a few of the problems studied. Construction practices and financial aid to small industries by communities were other important subjects.

The facts brought out in the series of theses are said to point to many new and progressive developments of value to the industries surveyed, and particularly emphasize the usefulness of and the opportunities for this type of service by New England colleges to New England business.

An outstanding feature of several of the theses submitted to the council was the statement that some New England manufacturers are not using research methods in relation to production and marketing to the same extent as comparable firms in other sections of the country.

of 1 x 4-in. elm lumber (rough) are used in front of the units. This elm lumber is used because it does not mush. The straps are then hung for the third unit, which is placed in the doorway.

If there is a bad mixture of parts, and the like, in this unit or section, some wood is used to fill out open spaces. The loading clerk takes care of this very easily. The unit is then tied and the car is ready to move.

There were 110 stoves loaded in the car from which the pictures were obtained. For that reason three bands were eventually used. The saving of lumber noted above was accomplished by eliminating a 2 x 4-in. piece of lumber heretofore used across the center of each row of stoves throughout the entire loading of the cars. By eliminating these 2 x 4's, more stoves can be loaded into a car, since there is considerable space thereby saved.

Grinding Tungsten-Carbide Tools

Precautions Necessary for Best Results with the Cemented Tungsten-Carbide Edge—Frequent Light Grinds Desirable

TO procure economically a clean, sharp edge, correct rakes and angles, without undercutting the cutting edge and without checking or cracking the tip of the tool, is the main problem in grinding or regrinding tools tipped with tungsten carbide. What follows is taken from a pamphlet issued by the Carborundum Co., Niagara Falls, N. Y., relating to this matter.

As the material is different in nature from high-speed steel, it requires different methods and a different technique of handling. It is very hard compared with other materials. It tends to chip easily on the finished edge during grinding.

The sharpness of the cutting edge is most important in relation to the efficiency and productivity of tools made from it. Hence special grinding wheels, different from those in common use in tool rooms, special devices and methods of feeding and more care throughout are required.

Two Materials Must Be Ground Together

As the material lacks shear strength and ductility, it has no tendency to bend under stress, but will break easily. Therefore it is not built into solid tools but a small piece is fixed or inserted in a steel shank. This is done in such a manner that the cemented tungsten carbide is supported by the steel and the cutting edge is of the hard material. Since cemented tungsten carbide has an extremely high compressive strength, the stress is not absorbed by it but is passed on to the steel shank. Thus, tools tipped with this material are made larger in cross-section than the ordinary high-speed steel tool.

This construction of the tool makes the grinding problem more difficult because the two metals, having different properties, must nevertheless be ground at the same time and on the same grinding wheel. Many factors and variables enter into the problem of selection of proper grinding wheels for this super-hard cutting material.

The pamphlet goes on to discuss in detail characteristics of the work to be done, the size, speed and other particulars of the grinding wheel, the machine on which the operation is performed and the character of the operator. A few of the points brought out appear in the following:

Inter-Action Between Wheel and Tool Being Ground

As the hardness of the tungsten carbide material lies very close to that of the abrasive used in the wheel, there is a tendency for the wheel to become glazed very quickly, especially if it is a little too hard. Frequent dressing of the wheel therefore becomes important. The amount of stock to be removed from the nose of the tool largely affects the grinding wheel action. Where comparatively large amounts must be ground off, coarse grits and hard grades of wheels must be used. In this case a finishing grind should be made with a much finer wheel, particularly if hand-grinding is employed.

In general, the more rigidly a tool is held or fixed, the softer the grinding wheel can be and the greater keenness will be made in the cutting edge of the tool. Pressure of the work against the wheel is of special importance. High pressure causes rapid wheel wear and excessive heat, with no faster removal of stock.

Large-diameter grinding wheels give cooler action and permit the use of harder wheels. Wheels perform harder at high speeds than at low speeds. Excessive speeds are not recommended because of this harder grinding action, the recommended range being from 4000 to 5500 surface ft. a minute.

A Job for a Specialist

Regrinding of tungsten-carbide tools should be done in centralized tool rooms by men who do little else. They should be supplied with high-powered magnifying glasses or microscopes to permit examination of the cutting edge of every tool to be reground. This is because the condition of the cutting edge is of such great importance and has such a large bearing upon satisfactory performance in use.

On production jobs it is good practice to grind the tools on a definite schedule. This may be based on hours of service or number of pieces machined. It has been found that production rates frequently can be greatly increased by grinding the tools more often, and speeding up the machines in which they are used. Factors such as time for setup, time of grinding and increase in machine speeds must be studied, to determine just how often the tools should be ground.

Frequent honing or stoning of the cutting edge without removing the tool from the setup is recommended. This removes small particles of metal clinging to the cutting edge, and causes it to present a clean surface and sharp edge. For this reason it increases the life of the tool between grinds, and so saves both in the grinding time and in the setup time of the tool.

Research Building Under Construction

An engineering and research building of seven stories, now under construction, will house the development work of A. O. Smith Corporation, Milwaukee. Eventually, 1000 men, carefully selected research engineers and scientists, will carry on this work of invention and discovery.

This research staff already records among its achievements the development of the revolutionary pipe mills, automatic frame plant and the welding plants of the corporation, as well as many contributions to the scientific information and working principles of the industries the company serves.

Gives Stock to Employees on Crane Anniversary

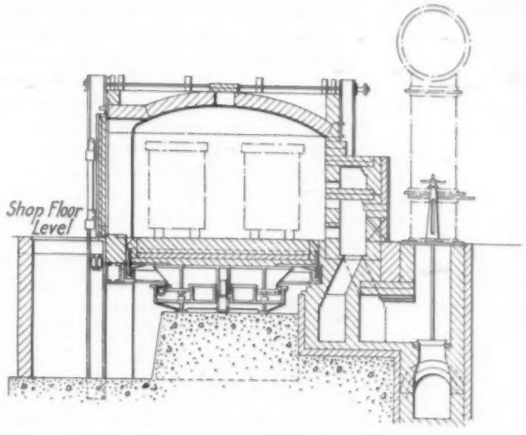
R. T. Crane, Jr., president, Crane Co., announced on the seventy-fifth anniversary of the founding of the company a personal gift of $4,000,000 in stock to employees. Three such gifts have been made by Mr. Crane out of his stock holdings since 1926. These were made at Christmas time in 1926, again at Christmas in 1928 and again this week on the observance of the anniversary of the company. The total value of the stock given to employees by Mr. Crane is more than $10,000,000. The present gift is to employees who have been with the company ten years or more, ten shares going to each man and woman with ten years' continuous service and one additional share for each year of service over ten years.

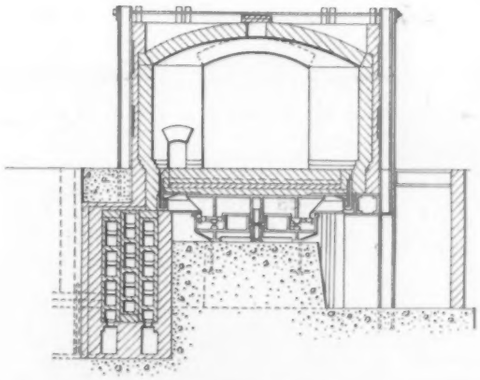
General American Tank Car Corporation is now producing for the Aeronautics Division of the United States Navy Department special tank cars which will be used for transporting helium gas from the Amarillo, Tex., fields to the naval base at Lakehurst, N. J. Each tank car will weigh 200,000 lb.

Rotary-Hearth Furnace for Annealing

Recuperative Heating by Gas in Controlled Atmosphere Gives High Operating Efficiency and Uniform Product

MOTOR-DRIVEN furnaces having rotating hearths have been installed in many English plants for open or box annealing or for carburizing by Kingtaudevin & Gregson of Sheffield, England. This design is now being introduced into the United States by H. L. Dixon Co., Pittsburgh, and it is claimed that the port arrangement, use of recuperators and of gas and air control will effect a low fuel consumption even when a definitely reducing atmosphere is maintained.





SECTIONS Through Rotary-Hearth Furnace, Taken at Right Angles to Each Other. Inside diameter of walls is 11 ft. 3 in. and walls are 13½ in. thick. Table is 10 ft. 3 in. in diameter

The general conditions obtaining in this furnace are said to be such that uniform annealing and a definite acceleration and gradient of temperature may be accomplished. The furnace is well suited for open annealing of a variety of materials. In the reducing atmosphere the life of the pots is said to be increased at least six times, and the usual scale that appears on annealing pots is replaced by a red "bloom." Under average working conditions a uniform heating throughout the pots is consistently maintained. The furnace is generally designed for producer gas fuel, although the port construction may be modified for the use of natural gas, oil or tar.

Air for combustion first passes through recuperators beneath the floor level, where it is heated by the waste gases on the counter-current principle. This hot air passes into mixing chamber where it meets the hot gas, and partial combustion extends into the furnace. Some air is bypassed into the furnace from the recuperators, thus completing combustion in the furnace. The products of combustion are directed across the furnace, where they make contact with the pots containing the materials to be treated, and a swirling atmosphere is set up as the gases are carried around the chamber. Waste gases are carried from the furnace chamber into the recuperators and thence to the chimney.

The furnace chamber itself is circular in plan, as shown by the drawing, and of a dimension that depends upon the capacity required. The hearth is built on a heavy casting, and floored with fire brick laid on insulating material.

This whole movable unit is carried upon an iron base plate by means of a ball race. The hearth and bed plate castings are of such a design as to form an oil chamber in which the whole ball race is immersed. A gudgeon or king-pin maintains the rotating hearth in its central position and prevents any side thrust on the ball race. Rotation of the hearth is effected by means of a circular rack fitted around its periphery, engaging a worm gear. In order to protect the mechanical parts of the rotating table from the atmosphere of the furnaces and also to prevent the infiltration of any air into the furnace chamber, the circumference of the hearth has a lip projecting into a sand seal.

While the fuel consumption varies with the heating cycle and temperature, which in turn varies with the class of material treated, about 225 lb. of coal per gross ton of steel, not including boxes, is an average figure for English practice, when operating under normal conditions and with a reducing atmosphere.

College Seniors Undertake Business Researches

How new research facilities are being mobilized for the benefit of New England business by the New England Council is the story behind a novel cooperative experiment engaged in by the council's industrial committee and the engineering administration faculty of Massachusetts Institute of Technology, as a result of which some 25 senior students were this year put to work studying practical business questions posed by the council.

Specific research projects were proposed and the idea was immediately taken up by Massachusetts Institute of Technology, and an organized response to the council's suggestion was arranged. Twenty-five seniors in the engineering administration classes of Prof. Erwin H. Schell were assigned to research problems named by the council's industrial committee, of which Frederick H. Payne, now Assistant Secretary of War, was then chairman, and Ray M. Hudson is secretary. Individual students in other institutions, including Harvard, Dartmouth and Boston University, also conducted thesis researches along lines embraced in the council's suggestions.

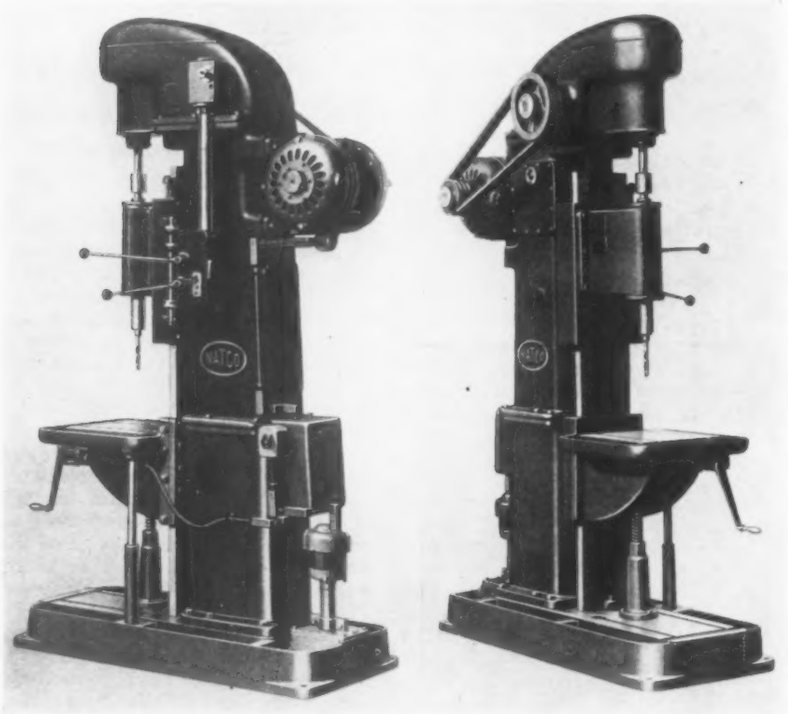
Application of modern marketing methods in New England industries, methods of eliminating seasonal variations in the motor boat industry, methods of controlling quality in metals manufacturing, steam power losses and cost control systems were a few of the problems studied. Construction practices and financial aid to small industries by communities were other important subjects.

The facts brought out in the series of theses are said to point to many new and progressive developments of value to the industries surveyed, and particularly emphasize the usefulness of and the opportunities for this type of service by New England colleges to New England business.

An outstanding feature of several of the theses submitted to the council was the statement that some New England manufacturers are not using research methods in relation to production and marketing to the same extent as comparable firms in other sections of the country.

Single-Spindle Drill Fitted with Hydraulic Feed

A SINGLE-SPINDLE vertical drill equipped with a semi-automatic hydraulic feed and having simplified means of instantly and positively controlling the head has been brought out by the National Automatic Tool Co., Richmond, Ind. This machine, designated as the model B-225H, is arranged with a flat slide for mounting either single or multiple-spindle drill heads, and is offered as a means of increasing production where the purchase of multiple or special equipment is inadvisable.



Multiple-Spindle As Well As Single Spindle Drill Heads Can Be Arranged On the Flat Slide of This Semi-Automatic Hydraulic Drill

The deep base is ribbed both lengthwise and crosswise, and working surface with T-slots is provided to accommodate fixtures for parts too large for the table. Either an adjustable knee type table or a solid built-in table can be furnished. Both the base and the table have ample channels for coolant. The column, which is of box section type, is provided with an opening in the rear to permit adding auxiliary counterweights. The oil reservoir for the hydraulic system is located in the column, near the top. The slide which mounts the head, or heads, is 22 in. long, 14¼ in. wide and has a maximum travel of 12 in. The distance from the face of the slide to the center line of the driving shaft is 8¼ in.

Instant and positive control of the head is obtained through the hydraulic feed. Power feeds range from 0 to 15 in. per min., and rapid traverse is at the rate of 95 in. per min. The operating valve trip mechanism is of the load-and-fire type. It is operated semi-automatically through adjustable dogs which cause the head to go through its cycle of rapid traverse to the work, feed for the drilling operation, rapid traverse away from the work and to stop at the end of the stroke. The operator starts the cycle by means of a hand lever. A second control lever near the starting lever is used for an emergency stopping or for changing the control mechanism from semi-automatic to hand control. By means of this lever, movement of the head may be stopped at any time during the cycle. When thus stopped, the head can be moved independently of the automatic trip dogs by means of the first lever. This arrangement is especially valuable for setting up.

Hydraulic pressure is supplied by a constant-volume pump which is protected by a relief valve set at 300 lb. per sq. in. The cylinder is of pull type and produces feeding pressure of 3400 lb. when the pump is under maximum load. The hydraulic operating valve is of balanced-piston type and is located above the oil reservoir, thus eliminating causes of leakage. All piping is concealed within the column and the neck of the machine.

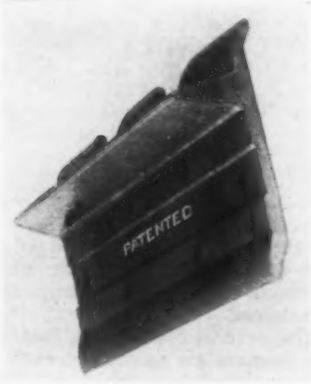
The drill is driven by a 5-hp. ball-bearing open-frame type motor through multiple V-belts, hardened spiral-bevel gears and hardened pick-off gears. These latter provide spindle speeds ranging from 100 to 1300 r.p.m. The spindle drive is a hardened alloy steel six-spline sleeve. The machine is ball-bearing equipped throughout, except for the counterweight sheave wheel, which is mounted on roller bearings. A cascade lubrication system is employed, and the coolant system includes a Ruthman (Gusher) centrifugal pump.

Develops Rolled Caterpillar Track Shoe

FOR a number of years the Caterpillar Tractor Co., Peoria, Ill., has sought to develop a track shoe which would have all the qualities looked for in shoes for track-type tractors. Practically all materials and methods have been tried out, with varying degrees of success. Originally, cast steel sections were used as cast.

Later, additional heat treatment was given and this form gave better results than cast iron and various alloys. After many experiments and discouraging experiences, the company developed a drop forged shoe that more nearly approached the ideal than anything attained up to that time. The particular section was difficult to produce, on account of great breakage and wear of the forging die. But the product lent itself much better to the application, both on account of the response to heat treatment and the greater wearing qualities. It was possible also to lighten the section, and thereby produce it at less cost.

More recently, after several years of development work, it has been possible to get a rolled steel shoe section. The finished part appears as shown. United States patent No. 1,705,802, granted March 19, 1929, covers it. It is only necessary to cut off, cope drill and notch to produce a finished shoe. This section lends itself admirably to heat treatment and has all the properties necessary for long life and economical production.



Cutting a Length from the Rolled Bar, Notching and Cope Drilling Produce This Track Shoe

This section is made from a special quality steel within the range of

S. A. E. 1045 (0.40 to 0.50 per cent carbon, 0.50 to 0.80 per cent manganese, not over 0.45 per cent phosphorus or 0.55 per cent sulphur. This specification calls for quenching in water at from 1475 to 1525 deg. Fahr.)

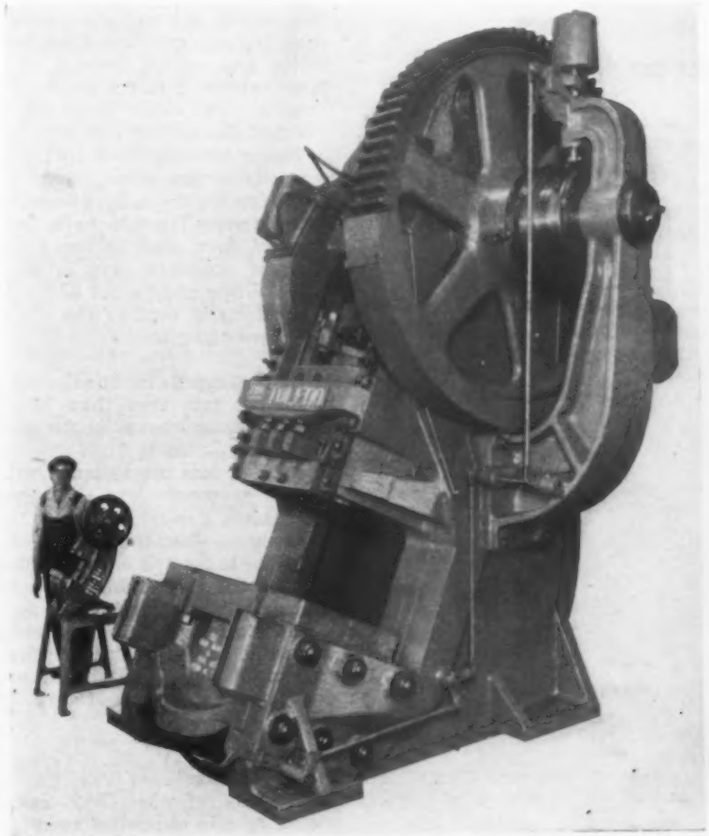
Ordinarily the shoes are used in the condition received from the rolling mill, excepting on special applications, where the shoes are quenched and drawn so as to obtain the hardness and wear resistance on the grouser section while retaining great toughness and strength in the flat section. The hardness of the tip of the grouser ranges between 45 and 55 sclerescope.

Inclined Open-Back Press of Record Size

WHAT is believed to be the largest inclined open-back press ever built was completed recently by the Toledo Machine & Tool Co., Toledo, Ohio. Because a large part of the frame sets below the floor, the accompanying illustration does not fully indicate the gigantic proportions of the machine.

The weight of the press is approximately 115,000 lb. The area of the bed, front to back and right to left, is 36 x 60 in., and the area of the slide face, front to back and right to left, is 30 x 30 in. The opening in the back is 36 in. wide. The die space, or the distance from the top of the bolster plate to the under face of the slide, with the stroke down and adjustment up, is 18 in.

Of the full eccentric type, the crankshaft is 10 in. in diameter at the frame bearings and 16 in. in diameter at the connection bearing. The slide has a stroke of 6 in. The press is fitted with a three-bar knock-out for the slide, and a centralized lubrication system for the main bearings. The machine is operated by a 25-hp. direct-geared motor through a train of steel gears in the ratio of 24 to 1, making 15 strokes per min. The Toledo jaw clutch, operated by a foot treadle, controls the press.



The Press Weighs 115,000 Lb. A large part of the frame sets below the floor

Vertical Coolant Pump in Two Sizes

A newly-designed, vertical coolant pump, especially adaptable for centerless grinders or other coolant purposes, is being made by the Tomkins-Johnson Co., Jackson, Mich. This centrifugal pump uses no packing and is said to be troubleproof, and to avoid clogging. Simple in design, sturdy in construction and efficient in operation, it is called the Brownie.

No. 1 has a capacity of 50 gal. a minute with a maximum lift of 15 ft., a ½-hp. motor, used with direct motor drive, and a speed of 1725 r.p.m. The height over-all is 19⅝ in., including motor, and pump can be placed in an 8½-in. diameter circle. The outlet pipe is 1¼ in.

No. 2 pump has a capacity of 15 gal. a minute, a maximum lift of 10 ft., a ¼-hp. motor, a 1-in. outlet pipe, height, including motor, 19⅛ in.

There is no bottom or pan under impeller to collect grit or chips. The driveshaft, impeller and protector tube are one unit, revolving together. With the intake at top, coolant is never forced upward between housing and protector tube, and never comes in contact with ball bearings. The lat-

Made in Two Sizes, Using No Packing, This Pump Handles Coolant, Even When Full of Chips

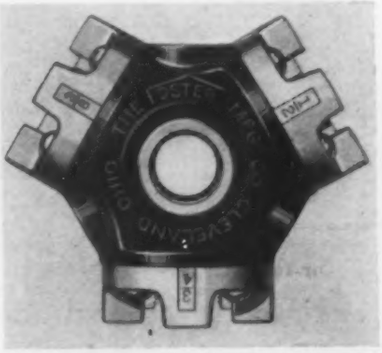
ter is within 1 in. of impeller, which is entirely self-alining.

This pump handles a heavy mixture of coolant, with grit or chips, as efficiently as it does clean oil.

New Three-way Pipe Tool Threads Close to Walls

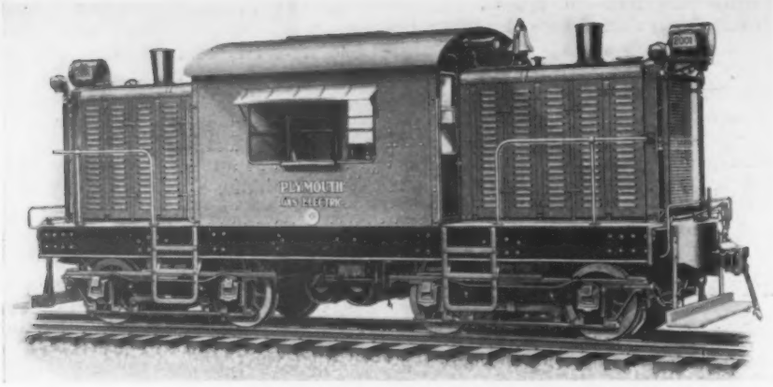
A NEW three-way threader for ⅜, ½ and ¾-in. pipe that will put a standard length thread on a pipe as close as 4⅝-in. to the wall, has been announced by the Oster Mfg. Co., Cleveland.

This new threader, called the No. 000 Chip Chaser, uses the same open-



This Tool Will Cut a Thread On Pipe As Close As 4⅝ In. to the Wall

type die holders as the company's regular "chip chasers," allowing a large area for oiling and chip clearance. It is small in size, light in weight and evenly balanced. A ¾-in. handle is standard equipment.



Gas-Electric and Oil-Electric Locomotives

A NEW line of gas-electric and oil-electric locomotives has been brought out by the Fate-Root-Heath Co. (Plymouth Locomotive Works), Plymouth, Ohio, in a full range of sizes from 25 to 60 tons. Model GEL 50-ton gas-electric is illustrated.

This model, a popular size for industrial use, is 31 ft. 4 in. long and 9 ft. wide. The frame is built of 15-in. I-beams and 9-in. girder beams, rigidly constructed, with cast steel bumpers and bolsters. Two four-wheel, spring-equalized trucks permit the locomotive to negotiate sharp curves and ride rough track.

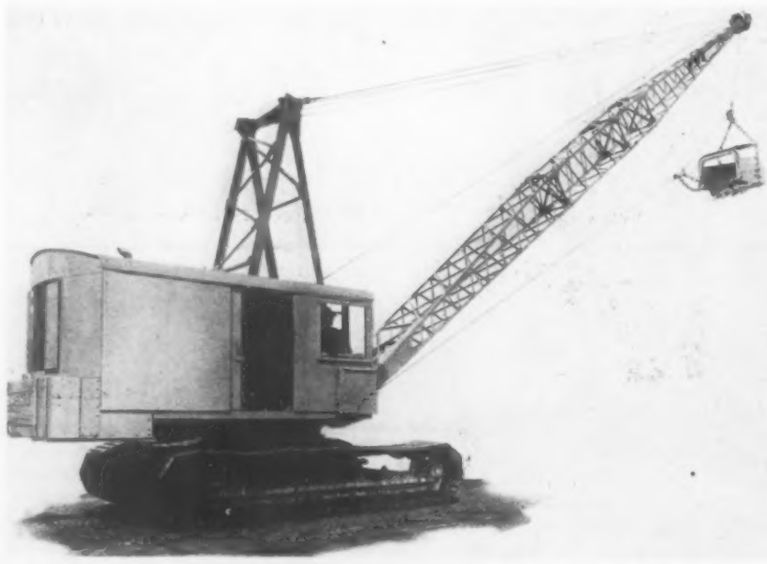
It is equipped with two six-cylinder engines, one in each end, developing 350 hp. at 1000 r.p.m. Westinghouse electrical equipment includes two 105-kw. 500-volt d.c. generators mounted on base with engines, and four 110-hp. motors, two on each truck.

Control of the engines, reversing, acceleration and speed control of the locomotive are accomplished from a single operating station. Westinghouse straight and automatic air brakes are standard equipment. The locomotive has a tractive force of 33,000 lb. at 2 miles an hour, and has a maximum speed of 36 miles an hour.

Handles 2-Cu. Yd. Bucket on 40-Ft. Radius

LARGE mobile drag lines, of 2-yd. capacity, for use in drainage and general construction work, are now being constructed by the Northwest Engineering Co., 28 East Jackson Boulevard, Chicago. This unit handles a 2-cu. yd. bucket on a 50-ft. boom at a 40-ft. radius. It is equipped with crawlers 17 ft. 5 in. long and treads 33 in. wide. A 200-gal. gasoline tank assures ample fuel supply.

The power plant consists of a Northwest variable speed motor, which is accelerator controlled. Clutches are shifted through a "feather-touch" control. All high-speed shafts are mounted on ball bearings and the drive from the engine consists of helical gears mounted on ball and roller bearings. This machine can be loaded on a flat car without major dismantling.



This 2-Yd. Drag Line Is Equipped With a 50-Ft. Boom and Treads That Are 33-In. Wide

Making of Solder-Coated Double-Walled Tubing

DESCRIPTION of the method of manufacture of solder-coated brass, copper and steel tubing by the Bundy Tubing Co., Detroit, is given in a report by Examiner C. W. Griffin of the Interstate Commerce Commission. The report dealt specifically with railroad rate classifications on these kinds of tubing, but, as a means of making clear the ratings the tubings should take, went into the matter of production.

This tubing is used in making feed lines for automobiles, tractors, oil burners and marine engines, and for making parts for mechanical refrigerators, gas heaters, oil cans and other apparatus. The process of manufacture is patented. The commodity is made out of brass, copper and steel strips 300 ft. long.

Each strip is given an acid bath to remove grease, treated to a light coating of solder, and then passed through a series of rolls which convert the material into a double-walled tube. The tubing is then subjected to a re-soldering and sweating process, and is cooled and passed over a receiving table, where it is cut to the desired lengths. The solder binds the double walls of the tubing together.

Tubing manufactured by the Bundy company ranges in gage from Brown & Sharpe No. 26 to No. 18 and in outside diameter from ⅛ to ¾ in. The value of $\frac{5}{16}$-in. steel tubing, a popular size, the examiner says, is 25c., and that of brass and copper 30c. a pound. The tubing is bent to the shape desired, according to the use to be made of it.

That shipped in bundles is over 4 ft., but not more than 11 ft., in length. The minimum length to which the tubing is cut is 3 in. and lengths of 4 ft. or less are shipped in boxes, barrels or crates. As the tubing is not flexible, it must be bent to the desired shape when it is made. Externally the brass and copper tubing resembles the steel tubing, because of the coating of solder.

The company has been shipping brass and copper tubing for the past four or five years. It began to produce steel tubing about three years ago.

The William Gent Mfg. Co. is the new name of the Gent company, maker of coin controlled vending machines and it has moved into a plant of 3½ acres extent at 17304 Neff Road, Cleveland.

Labor Liquidation May Be in Prospect

BY LEWIS H. HANEY
Director, New York University Bureau of Business Research

COMMODITY prices continue to move downward, with little change of pace. Several basic commodities are at or below cost of production; but we are again learning that cost does not determine price. When large stocks and excessive capacity exist, prices in competitive industries must fall to a liquidation basis, whether that be cost or lower.

Moreover, we cannot take the expenses of the past for granted. In the first place, a dollar will buy more than formerly, and expenses measured in dollars, therefore, should be reduced. Money is cheaper in the sense that interest rates are lower. Land rents, in dollars, are probably declining, and if the individual figures them as expenses, this item may be revised downward.

To Reduce Money Wages, But Not Real Wages

Then, there is labor—will it have to be liquidated? That is one of the major problems as we near the end of our "New Era" delusions. Certainly economic analysis suggests that *money wages* should be reduced, just as has been done automatically by sliding-scale arrangements in some steel and copper concerns. This does not mean any reduction in *real wages*.

As finished goods reflect or lead declines in raw materials, and as retail prices are tardily adjusted to declines in wholesale prices, the laborer's dollar will buy more. Hence a smaller number of dollars will procure for him the same amount of food, clothes, shelter, movie tickets and automobiles.

Many basic raw products, such as coal, copper, cotton, sugar, butter and wheat, must be near the bottom of this second great post-war deflation period. The Bradstreet price index, which consists largely of raw materials, is now 15.3 per cent lower than a year ago. It is the lowest for this time of year since 1915. But it is still 21 per cent higher than the pre-war low point, reached in August, 1914.

No one can say with certainty that it may not fall eventually to the 1914 bottom. Such movements, however, usually develop as waves, with at least temporary periods of recovery. To carry through, they require a whole set of complicated readjustments embracing wages, raw materials, wholesale markets and retail markets, to say nothing of the value of capital.

Lower Prices in the Making

Price-depressing forces are still in the ascendant, including declining purchasing power of factory laborers and farmers, large stocks of commodities, production levels not so much below normal as usual in a depression, and bank credit still in process of liquidation. The P-V line still points downward.

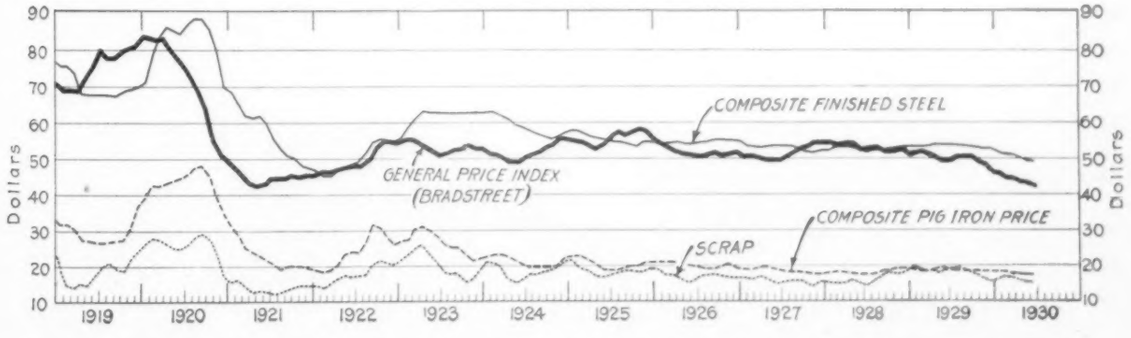
Forces tending toward higher prices are the progress made in curtailing production, backed by narrow profit margins or losses. This may be referred to as "shortages in the making," but not as shortages already made. Then, too, considerable progress in credit liquidation has already occurred, and bank deposits have turned upward.

When stocks of zinc, copper, pig iron, cotton and silk show a distinct and more-than-seasonal downturn, then we may look for a definite upturn in commodity prices.

Weakness in Steel Prices to Persist

As to the steel industry, we continue of the opinion that weakness in iron and steel prices will remain until the Bradstreet index has recovered, and until steel production has been brought down below the level of our "composite demand line," as illustrated in the last issue of THE IRON AGE.

Prices of pig iron and heavy melting steel scrap appear to be in normal relation to one another. But both are very high in comparison with the average of finished steel prices, and are being pressed down from above.



Weakness in Prices Persists and May Be Expected to Continue. Steel remains too far above general commodities and the gap was widened last month

This Issue in Brief

Speed up pickling by using stronger acid. But this cannot be carried too far, or much acid will be lost, and the bath soon become foul.—Page 82.

* * *

Classes teach open-hearth operators how to operate. Show them how much extra it costs if heat is not melted properly; how to adjust charge to avoid later delays and poor steel; how to get their helpers to use their brains. —Page 79.

* * *

What does Rockwell 39 hardness mean on Brinell or Scleroscope scale? Conversion table shows equivalents for a series of instruments and a long list of hardnesses.—Page 80.

* * *

"Acid brittleness," from pickling, is traced to excessive temperature. Efforts to economize unduly on acid stretched the pickling to twice the usual time and caused rejection of a carload of steel wire.—Page 83.

* * *

Steel scrap not favored as a cargo by steamship lines. It may damage the ship while loading or unloading; irregular shapes may cause it to exceed the 40 cu. ft. per ton allotted to cargo; its freight rate is low.—Page 85.

* * *

Pig iron output at lowest daily rate since January. June daily production 6¼ per cent below May and 20 furnaces were blown out during the month. Total output drops below 3 million tons.—Page 114.

Method of loading crated goods into box cars, to avoid displacement and crushing of contents, makes use of steel straps, with wood holding strips and upright struts. Said to save as much as 600 lb. of lumber bracing formerly used.—Page 95.

* * *

Furniture of alloy steels, chromium plated and lacquered, is rapidly finding its place in modern life. Designed by artists, it has a character all its own—not the copy of wooden furniture as we knew it a few years ago.—Page 75.

* * *

Electric melting for gray iron foundry said to lower cost and improve product. The method is flexible and aids in handling rush orders. Cast iron borings and steel chippings replace pig iron in charge.—Page 87.

* * *

Structural qualities of metal furniture are also its decorative qualities, obviating need for ornament, says a designer. This tends to hold the cost down.—Page 76.

* * *

Five things will burn a furnace wall or roof. Hence the operator must see that none of these has a chance to punish his brickwork at any time.—Page 78.

* * *

Save acid, steam, labor and time in galvanizing by controlling temperature of pickling bath. Additional advantage from proper control is improvement in the product.—Page 82.

Japan is buying huge tonnages of scrap from United States. Purchases in 1929 were 208,260 gross tons, against less than 9000 tons in 1923.—Page 84.

* * *

Make saving by using cast iron briquettes in cupola. Dodge Brothers charged 14,226 tons of briquettes in 1928 and saved over $100,000. Borings at $7.60 plus briquetting cost at $3.25 make $10.85, compared with pig iron or cast scrap at $18 or $19.—Page 88.

* * *

To unload 3600 tons of ore an hour at Presque Isle. Three huge machines are installed capable of taking ore, at 17 tons each bite, from the holds of Lake freighters. —Page 92.

* * *

Annealing furnace with rotating hearth said to operate with little fuel. Uniform annealing and definite temperature gradient claimed for British design.—Page 97.

* * *

Open-hearth operator must keep his furnace in repair. Bottom and bridge walls, blocks and slopes—all need constant attention. But do not put in so much dolomite at one time that it will not set properly.—Page 78.

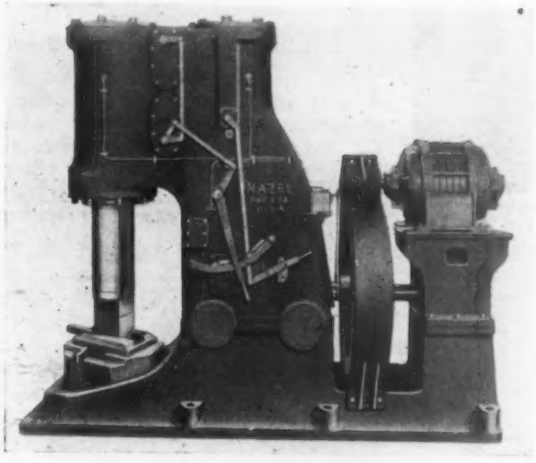
* * *

Self-baking electrode for use in electric melting furnaces is said to give economies through absence of butts and decrease in air corrosion. But it has to be handled most carefully for first half-day.—Page 94.

Motor-Driven Forging Hammer

A NEW type of hammer produced by the Nazel Engineering & Machine Works, Philadelphia, and illustrated herewith, will, it is said, deliver single and set blows, in addition to the variable automatic blows of the standard type. The new unit is called type S. This new feature is said not to require sacrificing the standard qualities of previous designs.

This unit was brought out to meet demand for larger motor-driven hammers for all kinds of general forging. The specifications of size 14, which is the one illustrated, include efficient capacity for forging steel up to 13 in. square. The motor of 75 hp. provides power for giving about 100 effective forging blows a minute.



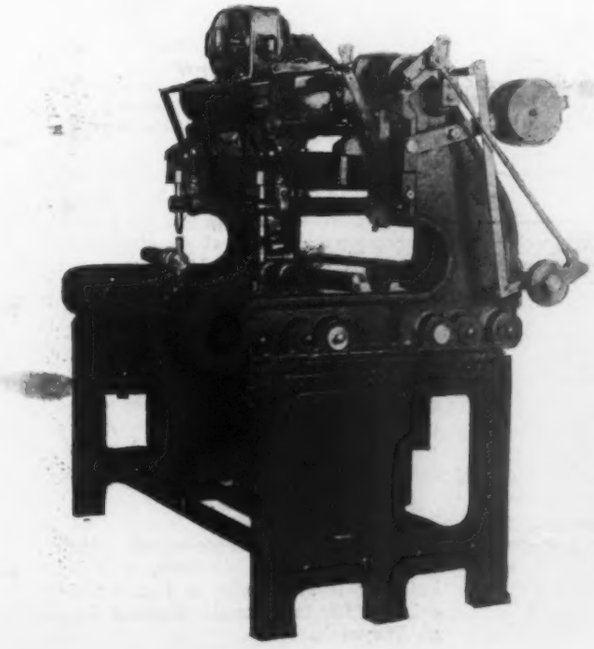
DESIGNED for Forging Sections Up to 13 In. Square and to Strike 100 Times a Minute

Stroke of ram and distance between dies, representing clear working space, are 32¼ in. Distance from center of ram to housing is 29½ in. Total weight is 72,000 lb., of which 26,000 lb. represents the anvil, bolster and dies.

Multiple Spot Welder

A MACHINE for welding flat work, shallow boxes and the like has been developed by the Agnew Electric Welder Co., Milford, Mich. In the form shown it is 50 in. between housings, has a throat or reach of 16 in., and contains two welding heads, but any width of machine is available between limits of 24 and 150 in. The widest one can be equipped with additional transformers and welding electrodes to make 24 spots at each stroke.

These machines are motor driven, fully automatic, and may be equipped with feeding devices for handling work through or across the machine. The electrodes may be set at any point across the width or depth of the machine. In operation, each spot is welded exactly as though it were made by one of a battery of single-spot welders—that is to say, each pair of electrodes has its own transformer, and is capable of independent regulation for pressure and welding current.



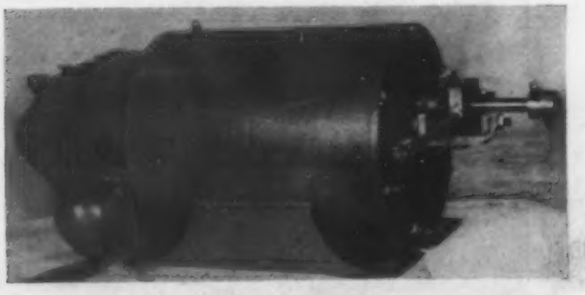
FLAT Pieces and Shallow Boxes Are Spot Welded Rapidly. Machines up to 150 in. in width and making 24 spots at each stroke can be furnished (at left)

Units for Driving Welding Head

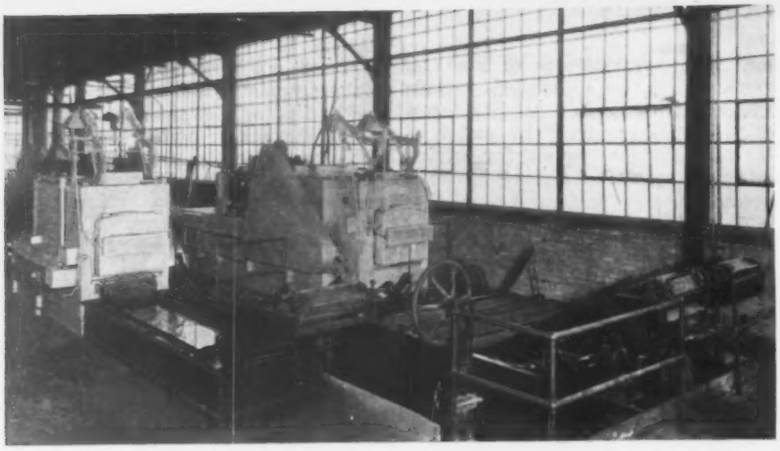
A COMBINED motor and three-speed reduction unit to drive work-handling devices for automatic welding has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh. The requirements of the service are high gear reduction with extremely wide speed ranges and compactness. It is also necessary that provision be made for engagement and disengagement of the drive while the motor is running. This combination can be obtained with standard existing drives only by coupling a number of units together.

The gear ratios in the three gears of the unit illustrated are 534:1, 1295:1 and 3060:1. With field control on the motor, an uninterrupted speed selection between 0.393 r.p.m. to 6.67 r.p.m. was obtainable at the final shaft of a recently tested unit. The torque output rating is limited by the strength and wear resistance of the mechanical parts. This is 1500 in.-lb. with hardened gears and 400 in.-lb. with soft gears. A sprocket load of 1200 lb. is permissible on the final shaft.

All gears are of the spur gear type and all bearings anti-friction bearings. The gear shafts and bearings are mounted in gear frames that can be removed from the housing as two separate units for ease of inspection and replacement. The unit has been applied to the 1/3-hp., 60-volt, direct-current motor parts, and the mechanical parts are housed in a welded cylindrical frame bolted to the motor frame, as shown by the illustration.



Wide Range of Speed, and Extremely Slow Rotation Is Procured by Proper Selection of Gear Ratio and Adjustment of Current into the Motor Field



Conveyor Furnace of Floating-Belt Type

A CONVEYOR furnace for the quantity heat treatment of small parts has been developed by the Hevi Duty Electric Co., Milwaukee. The floating-belt type of furnace is distinguished by the method of driving conveyor through furnace chamber.

This conveyor consists of a woven-mesh belt of the floating reinforcement type, made of high-grade heat-resisting nickel-chromium alloy wire. It is of 3/16-in. mesh and will support work of this diameter without catching in the mesh.

The conveyor belt is supported on driven rollers throughout the furnace chamber, which impart the driving impulse uniformly at closely adjacent points. It is said that wear is virtually eliminated and no distortion occurs from a dragging load. A removable end section of the furnace permits ready access to the conveyor, the speed of which is variable.

As no hearth plate is used, the bottom heating elements radiate heat directly through the conveyor to the work. There is a relatively small heating chamber for a given rate of production. A furnace having a hearth area of only 18 in. by 12 ft. heats 1000 lb. of small parts an hour at 1550 deg. Fahr. Loading densities as high as 30 lb. to the square foot have been found practical.

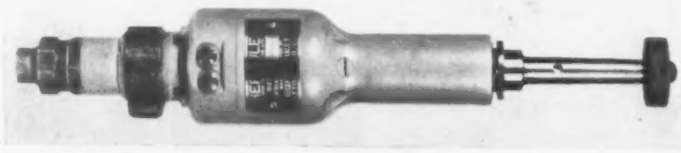
Heating elements are located on the side walls, beneath the conveyor, in the arch, and at all available places at the discharge end of the furnace. The furnace is furnished in five standard sizes, with production rates from 250 to 1400 lb. an hour.

Portable Pneumatic Grinder and Nut Setter

A PORTABLE grinder that runs at a free speed of 22,000 r.p.m. and a new type nut setter are recent additions to the **Hercules air tool line** manufactured by the Buckeye Portable Tool Co., Dayton, Ohio.

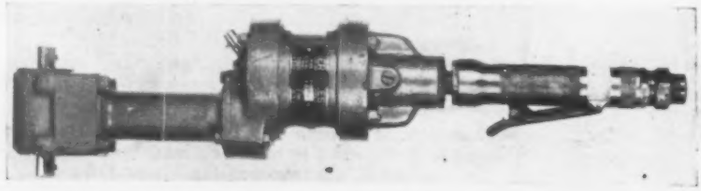
The grinder, designated as the No. 113-3, weighs only 3½ lb. It is especially adapted for use with small emery wheels, emery pencils, rotary files and similar tools and can be employed in very close quarters. The throttle and rear head are in one piece, and the throttle, of new type, can be operated with a touch of the thumb. Without the extension-shaft spindle, this tool measures 12 in. in length.

The nut setter, also shown herewith, is designated as the No. 017-5 angle nut driver. It is designed for use in close quarters, and has capacity for driving ½-in. nuts and ⅝-in. cap screws. Two speeds, 660 and 1000 r.p.m. are obtainable. The tool is 21 in. long and weighs 11¼ lb.



The Grinder (upper) Uses Small Emery Wheels, Pencils and Rotary Files. Without the extension spindle, it is 12 in. in length

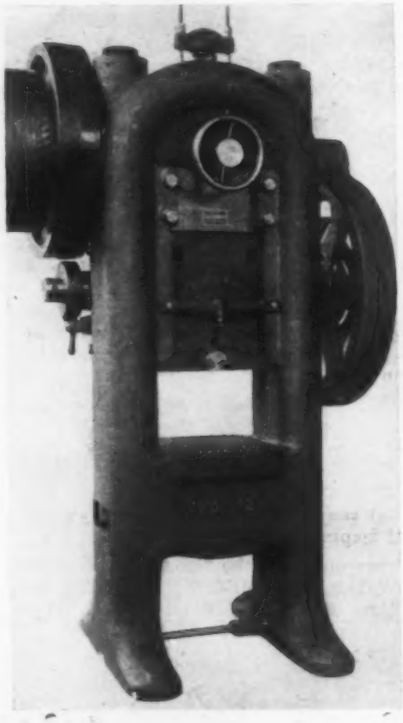
The Nut Setter (lower) Is for Use in Close Quarters



Pillar Toggle Presses

FOR extruding collapsible tubes as well as for ordinary embossing operations the Zeh & Hahnemann Co., 182 Vanderpool Street, Newark, N. J., is offering a new line of pillar toggle presses.

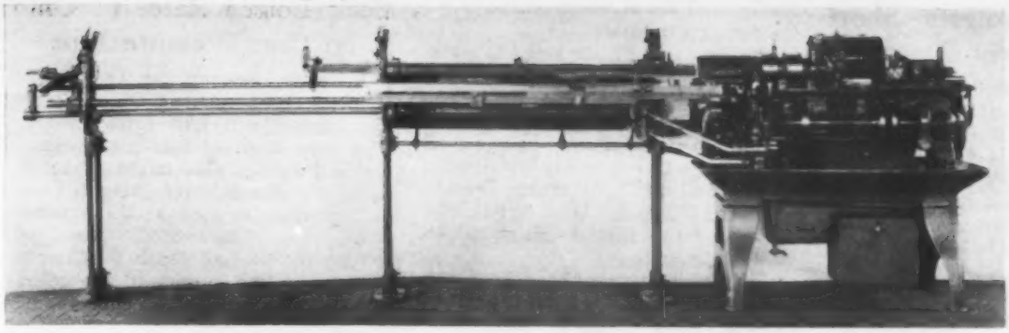
Although rated as exerting pressure of 150 tons, the No. 12 press illustrated is tested at 225 tons, an overload of 50 per cent. It is back geared at the ratio of 6½ to 1 and operates at a speed of 40 strokes a minute.



In Addition to Ordinary Embossing Operations, the Press Is Adapted for Extruding Collapsible Tubes

Hot-shrunk steel stanchions reinforce the solid frame. The toggle drive is arranged to produce a practically uniform speed of the slide toward the end of the down stroke, the motion being controlled by the company's non-repeating clutch. Automatic feeds can be furnished. The machine illustrated weighs 12,000 lb.

Two so-called high-speed steel treating furnaces, oil fired, will be built by Ryan, Scully & Co., Philadelphia, for the Landis Machine Co., at Waynesboro, Pa.



AUTOMATIC Rod Magazine for No. 2 B & S Automatic Screw Machines. The mechanism is connected with the feeding arrangement of the screw machine

Adds to Line of Automatic Rod Magazines

AN automatic rod magazine for the No. 2 sizes of B & S automatic screw machines has been placed on the market by the Brown & Sharpe Mfg. Co., Providence. It is similar to those previously built by the company and is adaptable to overhead and motor-driven machines, both regular and high-speed types.

The mechanism of these automatic magazines is connected with the feeding arrangement of the screw machine in such a manner that when the end of the bar on which the machine is working passes a given point, the entire machine, except the spindle, stops automatically. The mechanism of the rod magazine then engages and a new rod is fed into the spindle to the working position. The machine then starts automatically.

With this new size all B & S screw machines and screw threading machines, except the Nos. 4 and 6 automatics, can be equipped with an automatic rod magazine.

The machines can be equipped with a vertical slide for cutting off, leaving the cross slides free for forming and other operations, and the automatic rod magazine, which eliminates hand stocking of the machine, can be applied. Certain classes of nuts and tapped parts can be manufactured on these machines by mounting a tap in place of the die. Should one operation be required, the die spindle can be arranged for holding a drill, a maximum drilling speed of 12,000 r.p.m. being available if desired.

Redesigns Automatic Screw Threading Machines

THE Nos. 00 and 00G high-speed automatic screw threading machines built by the Brown & Sharpe Mfg. Co., Providence, have been redesigned to give a greater range of speeds. The work spindle and the die spindle now have 20 speeds each, providing 30 combinations from which to select the most efficient threading and work spindle speeds for various materials.

Important features of the previous design have been retained. Both the work and the die spindle run in the same direction but at different speeds, which permit the die to run on at the required surface speed, after it has been fed to the threading position. The tripping mechanism provides accurate control of the length of thread; it stops the die spindle instantly when the thread is cut to the required length, leaving the die to run off at the speed of the work spindle.

WORK and Die Spindles Now Have 20 Speeds Each. A vertical slide for cutting-off and an automatic rod magazine can be applied

Polishing Machine for Chrome-Nickel Sheets

LICENSE to manufacture and sell the Mulholland oscillating polishing machine designed for use on chrome nickel and other high finished sheets has been acquired by the Wean Engineering Co., Warren, Ohio.

These machines were invented by David E. and Walter Mulholland, Norwich, N. Y., with the technical assistance of Dr. F. C. Langenberg, Burlington, N. J. Several of them are in use in the plants of a large producer of stainless steel for rough grinding, polishing and buffing; they are said to produce economically a mirror finish, free from polishing marks, on stainless steel.

Under the license agreement, Mr. Mulholland and Dr. Langenberg will act in the capacity of technical advisors to users of the machine.

Simplification of Abrasive Grain Sizes Up

At a general conference recently held under the auspices of the Division of Simplified Practice of the Bureau of Standards, Washington, representatives of producers and users of abrasives unanimously approved a simplified practice recommendation on allowable limits for the sizing of aluminum oxide and silicon carbide abrasives for polishing uses and grinding wheel manufacture.

A report of the conference has been mailed to the members of the industry; if approved the recommendation will become effective Sept. 1.

Pittsburgh Protests Short Haul Freight Rates

PITTSBURGH, July 8.—Representatives of some 60 manufacturing plants in the Pittsburgh district met here today in the Chamber of Commerce Building, to make formal plans for objections to recent increases in short haul railroad rates on iron and steel products. Hearings before the Pennsylvania Public Service Commission will begin in Pittsburgh tomorrow, at which the traffic committee of the Chamber of Commerce will arrange a schedule for laying before the commission the objections Pittsburgh industries have to the new schedule.

The new short haul rates, which became effective May 20, under an order from the Interstate Commerce Commission, have been suspended in the Chicago district by the Indiana and Illinois State Commissions, but the Pennsylvania Commission lacks power to suspend the rates until after hearings.

It is estimated that the new rates will increase the Pittsburgh district freight charges by about $2,000,000 a year unless relief is obtained. In many cases the new rate amounts to a 100 per cent increase or more. As illustrations, the rate from Aliquippa to Pittsburgh has increased 128 per cent; from Blawnox to Pittsburgh 85 per cent; from McKees Rocks to Pittsburgh 140 per cent; from East Pittsburgh to Pittsburgh 91 per cent, and from Homestead to Pittsburgh 124 per cent.

The increased rates have already forced several important steel making companies to utilize river and truck service more extensively, and it is indicated that the movement has been so satisfactory in some cases that it will be continued in spite of changes in freight rates.

Favors Lower Water-and-Rail Rates

WASHINGTON, July 8.—The Southern Pacific Railroad will be permitted to establish a rate of 42.5c. per 100 lb., minimum carload, 36,000 lb., on iron and steel products from its piers in New York and Baltimore to Pacific Coast ports if the Interstate Commerce Commission approves a report by Examiner William A. Disque, made public last Wednesday. The present ocean-and-rail rate on iron and steel from the Atlantic to Pacific ports is $1 per 100 lb., minimum carload, 80,000 lb.

The Southern Pacific proposal is far reaching. It calls for the establishing from its Atlantic seaboard piers to California terminals and from California terminals to the Atlantic piers over the so-called Sunset-Gulf ocean-and-rail routes on substantially all carload traffic that is competitive with the intercoastal steamship lines operating through the Panama Canal of lower rates than apply to or from points in California, Arizona, New Mexico and Texas intermediate to the California terminals.

The Southern Pacific seeks to maintain a differential of about 10 per cent over the rates of canal lines. The iron and steel all-water rates from Atlantic to Pacific ports, including all charges, are generally 39c. over group B lines and 44c. over group A lines, minimum 36,000 lb. Most of the lines are under the former group, which are the slower lines.

On such products as bars, bolts and nuts the ocean rate is 41.5c. The Sunset-Gulf proposed rate on these products is 45c. The present rates of the Sunset-Gulf route from New York and Baltimore to the California terminals are generally the same as those applicable over the all-rail routes from Chicago and other points in so-called transcontinental group D.

The Southern Pacific route of movement is from Atlantic ports to Galveston, Tex., thence by rail to California terminals. The examiner said that the Southern Pacific lines, in view of their multiple-loading plan, expect to carry on the average, and perhaps in most all instances, at least 70,000 lb. in each car.

There are between 35 and 40 canal lines competing for intercoastal business. They protested against the application of the Southern Pacific to reduce its rates. A large bulk of the steel tonnage moving from the Atlantic to the Pacific Coast is carried by the Isthmian Line, operated by the United States Steel Products Co., a subsidiary of the Steel Corporation.

General Electric Co. Orders Fall Off Moderately

Orders received by the General Electric Co. for the second quarter of 1930 amounted to $99,916,027, compared with $119,351,248 for the corresponding three months of last year, according to Gerard Swope, president. For the six months ended June 30, orders amounted to $190,313,758, compared with $220,716,456 for the first six months of last year.

As a result of the transfer of radio set and tube business outlined in the 1929 annual report, orders received in 1930 do not include radio sets or tubes.

To Specialize in Steel Exploitation

The Penton Publishing Co., Cleveland, beginning with the July 3 issue, gave the *Iron Trade Review* a new name. The new name, *Steel*, has been adopted as defining the scope and purpose of the publication more accurately, as it now dedicates itself "to the exploitation of steel."

Besides the name, changes have been made in arrangement of editorial and advertising pages and in typography. In addition to running news articles and market reports, the plan is to present a weekly digest of happenings in the technical branches of the steel industry.

Seek Lower Rates in Ohio on Cast Pressure Pipe

A recent hearing for the Public Utilities Commission of Ohio regarding intrastate freight rates on cast iron pipe disclosed that manufacturers of pressure pipe might make an effort to obtain lower freight rates on this class of pipe at the expense of soil pipe. The United States Pipe & Foundry Co. and James B. Clow & Sons are prime movers in the effort to obtain lower rates on short hauls within the State of Ohio.

W. E. Clow, of James B. Clow & Sons, in a statement at the hearing, said that the soil pipe business was formerly concentrated in the North, but that the Louisville & Nashville Railroad, in an effort to locate industries in the Birmingham district, agreed with some of the manufacturers of soil pipe to put their product on the pressure pipe rate if soil pipe manufacturers would go to the Birmingham district to produce it.

Mr. Clow stated that soil pipe never had any right to be in the same rate with pressure pipe and that the railroads had lost large sums by keeping it there. He said that soil pipe is shipped in box cars instead of open cars and that the breakage in transit is much greater than is the case with pressure pipe.

Centers Die Rolling at Buffalo Plant

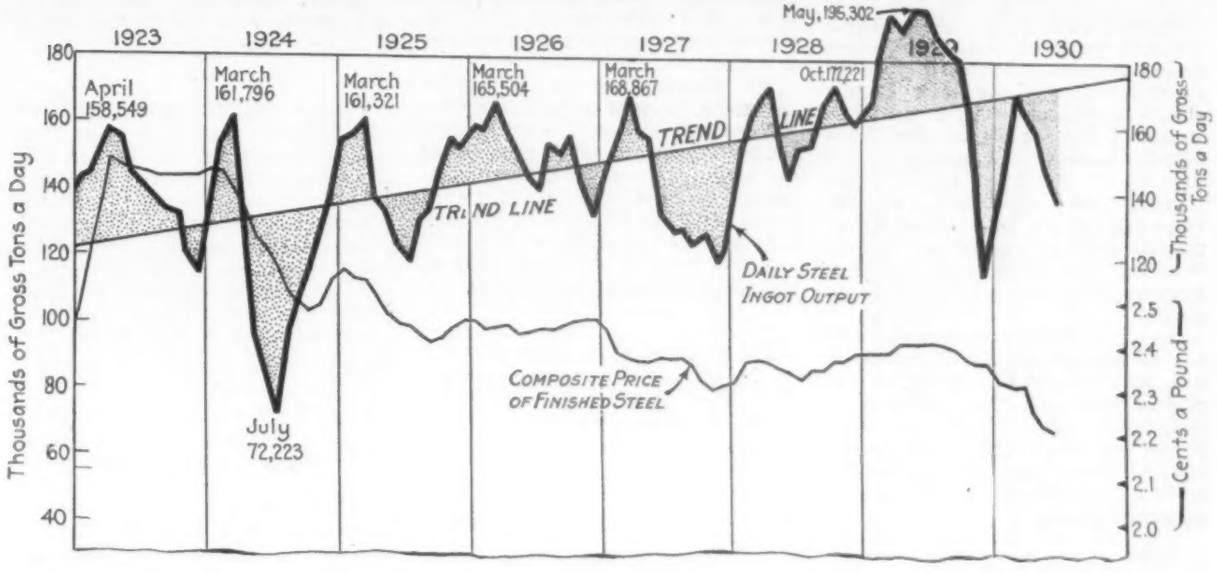
Substantial economies in die-rolling operations of the Republic Steel Corporation have been accomplished by concentration of die-rolling equipment at the Donner plant in Buffalo, according to officials of the corporation. Removal of such equipment from the Witherow plant at Pittsburgh has been completed.

In order to provide for a large volume of production a new building covering approximately 15,000 sq. ft. had been erected at Buffalo. By means of the Witherow process it is possible to roll automobile axles and other parts direct from steel, thus eliminating the necessity of forging.

In addition to a saving in overhead by the consolidation of the two plants, economy has been effected by the elimination of freight and handling charges on billets. On account of ability to handle larger billets at Buffalo, it is stated that a saving of 5 per cent in scrap loss has also been made.

The American Arbitration Association, 521 Fifth Avenue, New York, has linked up 300 trade associations in a unified national arbitration system. In 1929, in its New York City Tribunals, 344 cases were submitted to arbitration, and in only four of these cases were appeals made to the courts to have the awards of the arbitrators set aside. In three of the cases appealed the courts upheld the arbitrators' awards and one case is still pending.

Ingot Output in June Dropped the Curve Still Further Below the Long-Time Trend Line. It made the lowest level, except for last fall, since 1927. Prices in June continued the sharp drop of April and May



Ingot Output Slumps Further in June

Daily Production 7.7 Per Cent Under May—Total for Six Months Was 18 Per Cent Below 1929—Annual Rate 47,700,000 Tons

PRODUCTION of open-hearth and Bessemer steel ingots in the United States in June is calculated by the American Iron and Steel Institute at 3,440,239 gross tons. This is a loss of 584,539 tons (14.5 per cent) from the May figure. But, as it was made in 25 working days in place of 27, the rate of reduction in the daily average was less. The daily output was 137,610 tons, compared with 149,066 tons in May, a drop of 7.7 per cent.

Revisions have been made by the institute in its compilation of figures for 1929. All current figures are based on reports from companies which made 94.27 per cent of the total 1929 production. The estimate affects the 5.73 per cent for companies not reporting monthly.

While the June daily output is much lower than in either of the four preceding months, it is considerably larger than the figures for December and November. With those two exceptions, however, it is the lowest since the last month of 1927.

Fifth Largest First Half

For the first six months of the year production was 23,793,199 tons. This shows a recession of 18 per cent from the 29,036,274 tons made in the first six months of 1929, according to the adjusted and revised figures. With the further exceptions of 1928, 1927 and 1926, the output in the first six months of 1930 was the largest ever reported for such a period.

But it was almost equal to the 23,807,387 tons of 1927. The total for six months was at a daily rate equivalent to over 47,700,000 tons for the year.

Bessemer tonnage showed a sharper decrease from May than the drop in open-hearth tonnage. This decrease was almost 23 per cent, whereas open-hearth ingots showed a loss of about 13.2 per cent. The figures do not cover electric and crucible ingots, which no longer are collected monthly. In 1929 the production of these ingots was about 1725 tons each working day.

Curves of ingot production and of finished steel prices are carried in the diagram from the beginning of 1923. The table gives the monthly output of open-hearth and Bessemer steel ingots as reported by the institute for the past 18 months.

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(Gross Tons)

	Reported by Companies Which Made 94.27 Per Cent of the Steel Ingots in 1929		Calculated Output of All Companies		No. of Working Days
	Open-Hearth	Bessemer	Monthly*	Daily*	
Total, 1928	40,538,657	6,591,217	49,865,185	160,338	311
1929					
January	3,692,062	549,616	4,500,131	166,672	27
February	3,590,826	489,279	4,328,713	180,363	24
March	4,180,408	596,691	5,068,176	194,930	26
April	4,025,409	640,351	4,950,053	190,387	26
May	4,275,161	707,484	5,286,246	195,787	27
June	3,999,363	622,004	4,902,955	196,118	25
6 months	23,761,229	2,605,425	29,036,274	187,331	155
July	3,922,053	649,950	4,850,583	186,561	26
August	3,987,400	668,023	4,939,086	182,929	27
September	3,624,954	642,886	4,527,887	181,115	25
October	3,631,674	642,235	4,534,326	167,939	27
November	2,796,214	522,672	3,521,111	135,427	26
December	2,375,797	360,489	2,903,012	116,120	25
Total, 1929	44,101,321	7,091,680	54,312,279	174,639	311
1930					
January	3,137,002	441,572	3,796,090	140,596	27
February	3,336,021	508,618	4,078,327	169,930	24
March	3,513,904	539,616	4,299,905	165,381	26
April	3,406,610	509,234	4,153,860	159,764	26
May	3,265,190	528,968	4,024,778	149,066	27
June	2,835,527	407,586	3,440,239	137,610	25
6 months	19,494,254	2,935,594	23,793,199	153,505	155

*Revised figures given for 1929.

The Belle City Malleable Iron Co., Racine, Wis., will install a Ryan-Scully gas-fired car-hearth annealing furnace for the treatment of steel castings.

To Coordinate Interior Waterways

WASHINGTON, July 7. — Construction and coordination of a great system of waterways and harbors of the country, advocated long before he was elected President, was assured when President Hoover signed the $145,000,000 harbors and rivers bill on July 4, one day after Congress adjourned. The act will mean an ultimate expenditure in excess of $400,000,000 and, as pointed out by the President, the program represents a larger project than even the Panama Canal.

He stated that the undertaking will provide employment for thousands of men and "should be fruitful of decreased transportation charges on bulk goods, should bring great benefits to our farms and to our industries. It should result in a better distribution of population away from the congested centers."

The work will be pushed "at all available points, in assistance to the temporary unemployment situation," the President said. It will take large supplies of materials and many years will be required before the entire project is completed.

In his statement issued after signing the bill the President explained that it provides for building the many remaining sections of a definite canalization of the river systems, through which modern barge trains of 10,000 to 15,000 tons of burden can operate systematically through the Mid-West and to the Gulf of Mexico, and through the Great Lakes to the Atlantic.

When completed, the system will have 12,000 miles of waterways, and will link by water many cities on the Mississippi, Missouri and Ohio rivers. Through the Great Lakes and Erie Canal many of these points will have access to central New York and the Atlantic.

Tool Builders Plan Second Cost Conference

A general conference on costs will be held by the National Machine Tool Builders' Association, Sept. 22 and 23 at the Hotel Clifton, Niagara Falls, Ontario, Canada.

Representatives of member companies are invited to submit for discussion questions of cost principles or technique, such questions to be forwarded to the associations' headquarters at 617 Vine Street, Cincinnati.

Cutler-Hammer Acquires Schweitzer & Conrad

Announcement is made by Cutler-Hammer, Inc., Milwaukee, that on July 1 the company acquired the common stock of Schweitzer & Conrad, Inc., Chicago, manufacturer of high-voltage equipment.

Schweitzer & Conrad will continue to operate as an independent manufacturing and selling unit. No changes in organization or personnel will be made except Beverly L. Worden, president of Cutler-Hammer, has also been elected president of Schweitzer & Conrad.

Mr. Conrad and Mr. Schweitzer have been retained as consulting engineers and will continue their interest in the management as members of the board of directors. Other members of the new Schweitzer & Conrad board are F. R. Bacon, who is chairman of the Cutler-Hammer board, and F. L. Pierce and Louis A. Lecher, also on the Cutler-Hammer board.

Milcor Steel Co. New Name for Milwaukee Corrugating

The Milwaukee Corrugating Co., Milwaukee, has changed its name to the Milcor Steel Co., effective July 1. Milcor is the trade name by which

Louis Kuehn

products of the Milwaukee Corrugating Co. have been known more than 25 years.

The new name has been adopted as being more representative of the present character of the company's business, which includes such products as expanded metal lath, corner beads, expansion window casings, metal base screeds, picture moldings, structural steel domes, cornices, metal shingles, architectural ornaments, and many other items used in building construction.

The company is one of the largest consumers of steel in the Milwaukee district. Its combined plants cover nearly 1,000,000 sq. ft. of floor space.

There will be no change in the management of the company under the new name. Louis Kuehn is president and A. J. Luedke is secretary and treasurer.

Plans and specifications for the new Supreme Court building in Washington will be ready about Oct. 1. David Lynn, architect of the Capitol, has been authorized by a House resolution to enter into a contract up to $8,240,000 for construction of the building.

Obituary

C. W. DICKERSON, vice-president and secretary of the Timken-Detroit Axle Co., Detroit, died on July 1.

—

WILLIAM M. MACCLEARY, mill representative in New York since 1919, died at Westchester Institute on July 2, aged 49 years. He had been identified in a sales capacity with the Wheeling Corrugating Co., and at one time had been sales manager of the sheet department of the Portsmouth Steel Co. During the war Mr. MacCleary was a member of the Steel Commodity Committee of the War Industries Board.

—

JAMES W. ROULSTON, vice-president, Stedfast & Roulston, Inc., Boston, died suddenly at his home in South Boston on July 1. He had been in failing health for a year or so, but had been active in business up to June 30. He was born in South Boston in 1863, and entered the employ of Hill, Clarke & Co. 50 years ago. He continued with that company and its successor until three years ago, when with Albert M. Stedfast, the business of Stedfast & Roulston, Inc., was organized to take over the Hill-Clarke Boston interests. Mr. Roulston was considered an authority on machine tools, and during his life was selected to do important appraising of New England industrial equipment.

—

WILLIAM E. FULTON, retired president of the Farrel Foundry & Machine Co., Ansonia, Conn., now the Farrel-Birmingham Co., and one of the outstanding industrial figures in Connecticut, died on July 2 at the Waterbury Hospital. A native of Brooklyn, Mr. Fulton went to Waterbury in 1873, and in 1877 became associated with the Farrel Foundry & Machine Co., of which his father-in-law, E. C. Lewis, was agent and manager in Waterbury. In 1880, Mr. Lewis purchased the Waterbury plant and operated it as a separate entity from the plant in Ansonia. Mr. Fulton was made secretary at that time and the name was changed to the Waterbury Farrel Foundry & Machine Co. On the death of Mr. Lewis, Mr. Fulton was made president of the company and held that office until he retired from business in 1919, when he was succeeded by his son, WILLIAM SHIRLEY FULTON. Mr. Fulton was also one of the organizers and president of the Waterbury Machine Co., which was subsequently consolidated with the Waterbury Foundry & Machine company. He was 77 years old.

—

GEDDIES G. STEWART, Cleveland district sales manager of the Youngstown Sheet & Tube Co. for the past 15 years, died July 7 after a short illness, aged 65 years. Previous to his location in Cleveland, he represented his company in western New York.

▲▲▲ PERSONALS ▲▲▲

JOHN T. BRODERICK, secretary of the General Electric Co.'s manufacturing committee, retired on July 1, concluding a continuous service with the company of 41 years. His period of service goes back to the early days of electrical development in America. He joined the Thomson-Houston Co. at Lynn, Mass., in 1889, as one of the factory staff of E. W. Rice, Jr., then superintendent of the plant. After several years as personal assistant to Mr. Rice, during which interval the General Electric Co. was formed, Mr. Broderick was elected secretary of the manufacturing committee. He has held that position ever since, a period of 36 years.

—

HAROLD S. FALK, vice-president and works manager of the Falk Corporation, Milwaukee, and a leader in apprenticeship training, has been elected a member of the Milwaukee Vocation School board. He succeeds the late Christian Scholtka, for many years general superintendent of the Nordberg Mfg Co., and one of the founders of the Milwaukee vocational training system.

—

JOHN DOUGLAS STITT, managing director of Redpath, Brown & Co., Ltd., steel fabricators with shops at Edinburgh and Glasgow and Manchester, England, has returned to England, together with his son, D. J. Stitt, who is attached to the London offices of the company, after a brief sojourn in Canada and the United States.

—

CHARLES D. ROBB, who has been a partner in the firm of C. W. Leavitt & Co., 30 Church Street, New York, for the past 26 years, is now associated with C. Tennant Sons & Co. of New York, importers and exporters of ores, metals and alloys.

—

L. B. LINDEMUTH, who during the recent illness of President Edwin Corning of the Ludlum Steel Co., has been acting as assistant to the president, has reestablished himself in consulting practice, specializing in iron and steel works operation, with offices on the forty-seventh floor of the Chrysler Building, New York.

—

EMIL A. IMBEMBO, of the Polytechnic Institute of Brooklyn, has been awarded the scholarship donated each year by the New York chapter of the American Society for Steel Treating for proficiency in metallurgy and heat treatment.

—

J. MCC. HILL has been placed in charge of a sales office which has been opened in the Candler Building, Atlanta, by the Fuller Lehigh Co., Fullerton, Pa., maker of pulverized coal-firing equipment and water-cooled furnace walls.

—

WILLIAM STRINGHAM, assistant general superintendent since 1923 of the East works plant of the American

William Stringham

Rolling Mill Co., Middletown, Ohio, has been made assistant vice-president. He joined the Armco organization in 1901 as a roller in the Central works plant and continued as a roller until 1912, when he was made assistant superintendent of the sheet and jobbing mill. Ten years later he became superintendent of the sheet and jobbing mill departments and was subsequently appointed assistant general superintendent of the East works.

—

E. E. WILD, who resigned some months ago as general manager of the Columbian Steel Tank Co., Kansas City, Mo., after having been with the company 12 years, has returned to the same organization as sales promotion manager.

—

SCOTT TURNER, director of the United States Bureau of Mines, will represent the American Institute of Mining and Metallurgical Engineers at the annual meeting of the Institution of Mining Engineers to be held at Birmingham, England, July 9 to 12.

—

ELMER C. MCKENZIE, heretofore with the Dura Co., Toledo, has been appointed assistant sales manager of the Ex-Cell-O Aircraft & Tool Corporation, Detroit, succeeding JOHN E. WELLS, who has become advertising manager.

MYRON C. TAYLOR, chairman of the finance committee, United States Steel Corporation, New York, returned from a European trip on the steamship Olympic, July 7.

—

DON F. KENNEDY has been appointed Western sales manager, with headquarters in Detroit, of Hammond & Irving, Inc., Auburn, N. Y. He was at one time identified with the Hammond Steel Co., Syracuse, N. Y., as Western manager. Since that connection, Mr. Kennedy has represented other industrial manufacturers in Detroit and has operated his own tool and die business in Detroit under the name of the Sterling Mfg. Co.

Completes 50 Years' Service in Chain Industry

MAJOR ADAM GARVER, superintendent of the Princess Street plant of the American Chain Co. at York, Pa., who has completed more than 50 years of service with the chain industry in York, was the guest of honor at a testimonial dinner given recently by his co-workers. W. L. Brown, manager of the American Chain Co. at York, presided at the dinner. W. T. Morris, vice-president and general manager of the company, and C. G. Williams, general operating manager, were the principal speakers. Walter B. Lashar, president of the company, who was unable to attend, sent a telegram of congratulations to Major Garver. Mr. Morris presented Major Garver with a gold medal commemorating his half century of service. Major Garver started as an apprentice in 1876 with the Keystone Chain Co. and advanced through various positions to that of the superintendency which he has held since November, 1914.

Electrochemists to Change Society's Name

At a meeting of the board of directors of the American Electrochemical Society, held during its spring meeting at St. Louis, May 29 to 31, resolutions were passed suggesting a change in the name of the society to The Electrochemical Society. A committee was appointed, consisting of Dr. Colin G. Fink, the society's secretary; S. D. Kirkpatrick, Acheson Smith, Stanislaus Skowronski and Dr. F. M. Becket, which was authorized and directed to incorporate the society under the laws of the State of New York, using the new name. Each member of the society will have an opportunity to vote upon the proposal.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

ESTABLISHED 1855

Wages Stabilized but Not Prices

THE National Industrial Conference Board has just completed a study entitled "Wages in the United States, 1914-1929." A summary notes that "the most significant feature in the trend of wages in the United States in recent years is the stability of hourly and weekly earnings." In six years the trend has been slightly upward.

The board considers it safe to assume that in future such wage changes as may occur will be found more in weekly than in hourly earnings; that when reductions in payrolls are necessary, from adverse business conditions, curtailment will be made in hours and through various operating economies, rather than in reductions in rates. Incidentally, it is estimated that employment last May was more than 10 per cent below last October, although seasonally there should be an increase.

In its statement the board makes practically no reference to causes of this wage stability. We hear a great deal about the philosophy of certain manufacturers, that they maintain wages because buying power is necessary. There is of course a glaring lack of proportion in this, for a corporation selling its product to nearly everybody employs only a minute fraction of the total working force, and certainly cannot do much one way or the other.

Of course it is a matter of not setting an example to other employers, and here is the real reversal of conditions. In the old days there was competition in wage reductions, one manufacturer hoping to get down to lower rates than his competitors. This became recognized as a particularly objectionable form of competition and it now is considered "bad acting" to reduce wages. Competition is decidedly strenuous and prices all around are far from being stabilized, which makes it all the more fortunate that wages practically are.

There are reasons in addition to the philosophic for wages to be held. The greatly increased mechanization is an important factor. For one thing, the responsibility on the man is greater, to avoid damage to expensive machinery and to get the best results from it, essential on account of the large investment. For another thing, there are not so many employees per unit of output.

As for actual data in connection with steel making, the Steel Corporation's statistics are sometimes cited. For a convenient comparison, taking double years as representative, in 1912-13 the Steel Corporation's employees in manufacturing properties represented one man per 79.1 tons of annual output of steel products for sale, while in 1928-29 the figure rose to 90.6 tons, or by 15 per cent.

But this 15 per cent is far short of the whole story. There was abolition of the 12-hour shift, necessitating the employment of more men per unit of output, and the Corporation is carrying its products to a higher average degree of finish. As to rates paid, the average daily earnings per employee, outside of general administrative and selling force, rose 114 per cent between 1912-13 and 1928-29.

Steel Costs and Operating Rates

IT would be of incalculable pecuniary benefit to the steel trade if a set of tables, only roughly accurate, could be worked out showing fluctuations in per ton costs at various operating rates. A table would be needed for each individual product, of course, and in many cases separate tables for different classes of mills making the same general product. No doubt some manufacturers have worked out more or less data of this kind, for their own individual cases, but it is quite improbable they have developed anything like as much as they could develop by a thorough study.

What we are referring to here is not the carefully secreted measures some manufacturers may have compiled, but information applicable to producers generally, whereby a given seller would be able to judge how the costs of his competitors were going up with a declining operation and be moved to relax his sales effort by the price cutting route through realization that his competitors were having troubles of their own.

Men who are in position to judge, at least roughly, claim that there are really few cases in the steel industry in which a 100 per cent operation produces in the long run the lowest average cost. There is a straining that has its costs, to operate at what is considered full capacity. If it is not a strain the typical manufacturer is likely to feel that the operation is not actually all of 100 per cent. Occasionally a guess has been made that an 85 per cent operation shows the minimum unit cost. Many manufacturers have sad and regretful recollections of what their "full" operation during the second quarter of last year cost them eventually, in strained equipment, in indifferent inspection and in various other ways.

The sheet and tin plate industries are particularly flexible in this matter of varying operation. A given plant is made up of a number of hot mills and some of these can be entirely idle, others running full. Men are paid tonnage rates and employment can be distributed by rotating crews at the mills that run.

A continuous strip mill, making a cognate and to

an extent an overlapping product, is in quite a different class, as it either goes or does not go. There is sales effort to make it go, when perhaps a more thorough and practical realization that competitors' unit costs are likewise mounting would bring about relaxation. Such a move would be welcome to all parties concerned, perhaps even to many buyers themselves.

It is true that through the medium of trade associations some efforts at compiling collective cost sheets have been made, but the contributors to such compilations do not seem to put much store in the results as announced, and so far as is known there is no relating of the individual producer's cost to his operating rate. A collection of costs and a collection of operating rates are thrown together, making an "average" and the dangers lurking in averages should be well known.

The desideratum, for practical use, is, for a given commodity and class of mill, a table showing the differences in dollars and cents cost per ton at various operating rates, say by intervals of 5 per cent. There are wide possibilities of interesting buyers in this matter. The typical buyer attitude is that the lower the seller's operating rate is, the easier it should be to secure a price concession from him. It should be possible to undermine or shade that view by the presentation of data having the ring of truth.

The Man and His Instruments

SOME one once extolled in rhyme the skill of "The Man at the Fire." A scientist took up the cudgels and made a case for instruments attuned to give a precision impossible to the fallible judgment of even the most skilled. In practice the two have been brought together—the instruments as an essential adjunct to the man's hard-won skill of eye.

Several systems of combustion control have been making headway in open-hearth furnace practice in recent months and their progress appears to be cumulative. But each is at the command of the melter. His is the judgment on which the heat is tapped, though the instruments may tell him when conditions are right.

There has been curiously little obstruction offered to these installations. The men are at first merely curious, albeit in the way of passive resistance. They have to be shown. They may resent the implication which the new idea appears to make regarding their skill, but there is no active opposition. In a week or two they begin to take real interest. In a month—barring unexpected trouble—they are completely "sold."

No scientific reasoning sways them. They are hard-headed men who have come up through the ranks. They have acquired their uncanny knowledge of steel through many a hard knock. But they can tell, and tell quickly, when a uniform temperature—maintained so by interlocking mechanism—adds to the life of the furnace roof. They learn very rapidly when a smoothly running furnace is turning out more steel each week, even though this may not directly affect their "pocket nerves." They appreciate a reduced fuel consumption, brought about by exactly proportioned air for combustion.

And they do not hesitate to spread the news. Every record in tonnage, low fuel cost, long run between shutdowns—all become common knowledge. Men operating furnaces not equipped with instruments strive to equal the new records. Failing in some particulars, as fail they almost inevitably must, they demand the same help their neighbors enjoy.

The Flow of Current Economics

CLASSIC economic doctrine is that there can be no such thing as over-production of goods, for goods are exchanged for goods. A primitive community living on its own produce will merely supply its natural needs. If climatic conditions are adverse it may suffer from a deficiency of food, fiber and fuel; if on the other hand climatic conditions are favorable the community may not have to work so hard to obtain its requirements. With the division of labor and the advent of trade, conditions gradually become more complicated, and with the present development of the world they are extremely complex, so it may result in there being an over-production of some things. On the whole, however, the economic trouble is unbalance, not over-production.

* * *

AT the conference of governors of the States in Salt Lake City the subject of raising money by a tax on sales was favorably received. In several of the States this is done already and has proved practicable. Indeed every State now levies a tax on the sale of gasoline. Economically a tax on sales is a tax on consumption and that is sounder in theory than a tax on production, besides being more wide-spread in its incidence.

* * *

THERE is a certain humor in the discussion of the naval treaty. The American naval experts say that this country has been unsafely trimmed. The British talk in the same way to Parliament in respect to Great Britain. The Japanese express a similar grievance. Evidently none of the military people like the treaty. Nor do some of our senators, who are trying to defeat ratification. That is their right. But why not have the desired speeches and then a vote without more ado? What is the sense in discussing the subject over the radio and appealing to an electorate which does not know any more of so technical a subject, and never will, than it does of the theories of Professor Einstein or the hypothesis as to atomic energy. There are many persons who possess doctorate degrees who do not comprehend any of those conceptions, nor the principles of naval parity. We do not suppose that longshoremen are mentally superior to doctors. However, the safety of the flag affords ground for an appeal to the emotions, which the Einstein theories do not. What really puzzles us is why some politicians should be so much concerned by this treaty, which most people are willing to leave to a patriotic administration.

* * *

THE anthracite producers and their miners have been conferring in respect to a new contract without any question as to further advance in wages, although the agenda stipulated no discussion of reduction. This union has done its worst, having contributed to the loss of market to fuel oil and com-

pressed gas, so that the anthracite producers now have to employ salesmen for a product that used to sell itself.

The non-unionized labor of the zinc smelters of Oklahoma recently averted a shut-down and consequent unemployment by imploring their operators to keep going and proposing a drastic reduction of their wages, their idea being that it was better to eat than to be hungry. Even so, the operators have to pile up zinc that they cannot sell.

The building mechanics of the unionized Northeast enforced an advance of wages May 1, 1929, and were meditating another demand for May 1, 1930, but were checked by the continuance of the depression. Their argument is that, being able to get work for only a few days a week, they must receive more pay per day in order to live.

* * *

THESE incidents reflect several views of labor in respect to itself. There is an interesting naïveté in the idea of more pay to compensate for slackness of work. This is like a merchant raising prices when sales become slow. It is a pity that there is so much work to be done and so many who refuse to work except at their own terms. The execution of public improvements under such conditions would be no economic benefit; rather, the reverse.

CORRESPONDENCE

Suggests a "Family Day" for the Mill

To the Editor: I am one of the many women in this great, wonderful country who is married to a man whose sole ambition in life, next to his family, is tied up with the steel industry. I fully understand my husband's ambitions and the love for his chosen work and try to understand everything I am told, although I am not very technically inclined. It remains there are a lot of things I am anxious to know.

I would like to see the superintendent, whom my husband describes as a very capable and a very generous man. I would like to see the mill from the inside. I know, of course, that there are regular "safety meetings" and doctors and nurses, if an accident should happen, but will every man do his duty toward his fellow men and make the mill a safe place to live and to work in?

I know there are many women who ask themselves these questions every day, women who would be more than grateful if they were allowed a chance to see the mill sometimes, the place where their men work.

So I suggest "Family Day." It would be so nice if the wife and older children could come along one particular day in the year to see the plant and the whole works.

Maybe they could start the day with a lecture on safety. A wise and understanding superintendent might talk about drinking and gambling—how it affects the work and safety of the employee. He might point out the importance of a happy home life, of good food and sensible clothes. How a good breakfast starts a man right, how a full cooperation in every respect from his family might make a man realize his desires, might make him get ahead.

After that, they could see the plant in groups, see their own husbands work. Some women, I am sure, will understand and appreciate their husbands better after that. Maybe they will give them more rest at home and not drag them to the movies all the time.

I hope that every mill will have its "Family Day" sometimes. It would result in more understanding and sympathy between employer and employee, in better work, a more cheerful atmosphere and less labor turnover. This is the humble opinion of

A WOMAN.

Beaver, Pa.

Mechanical Engineering at Chicago World Fair

A reproduction of the original Niagara Falls power plant, a model of which now stands in a field adjacent to the old Niagara Falls Power Co.'s stations 1 and 2, has been proposed as one of the exhibits to be staged at the Chicago World's Fair in 1933 to show the advances that have been made during the last hundred years in mechanical engineering.

The recommendation that a replica of the model be erected at Chicago is contained in a report of the mechanical engineering section of the National Research Council Science Advisory Committee under the direction of which all the mechanical engineering displays will be exhibited at the exposition.

The National Research Council Science Advisory Committee is composed of about forty leading scientists throughout the country who, under the leadership of Dr. Frank B. Jewett, vice-president of the American Telephone and Telegraph Co., are developing plans for all the science exhibits at the Chicago Fair.

According to the report of the mechanical engineering section the fair exhibits to be staged under its direction will include the following subdivisions, namely, power and power generation, applied mechanics, hydraulic machinery, printing machinery, materials handling management in industry, machine shop and manufacturing processes, machinery in the iron and steel industry, aerodynamics, refrigeration, air conditioning, heating and ventilation, wood industries, and textiles.

The mechanical engineering section includes W. L. Batt, president of S K F Industries, Inc., New York, chairman, and the following: William L. Abbott, Commonwealth Edison Co., Chicago; L. P. Alford, vice-president, Ronald Press, New York; K. H. Condit, *American Machinist*, New York; Prof. R. H. Fernald, University of Pennsylvania; Clarence F. Hirshfeld, Detroit Edison Co.; George A. Horne, Merchant Refrigerating Co., New York; A. L. Kimball, General Electric Co., Schenectady; Dean Dexter S. Kimball, College of Engineering, Cornell University; W. W. Macon, THE IRON AGE, New York; J. C. Oswald, New York Employing Printers' Association; Dean A. A. Potter, Purdue University, Lafayette, Ind.; C. W. Rice, secretary of the American Society of Mechanical Engineers, New York; W. A. Shoudy, New York, and R. V. Wright, secretary, Simmons-Boardman Publishing Co., New York.

Western Trunk Line Rates Increased

WASHINGTON, July 8.—Rates on iron and steel products in Western trunk line territory will be increased as the result of an exhaustive decision handed down today by the Interstate Commerce Commission. The decision provides that the rates shall take 32½ per cent of the first-class rates. The actual amount of the increase was not indicated.

No order was entered fixing the effective date of the rates but it was indicated it likely will be Nov. 30. Many other products were affected by the decision.

Western trunk line territory roughly extends west from Lake Michigan and the Mississippi River to the Rocky Mountains and north from and including Kansas and northern Missouri to the Canadian border.

The Week in Business

Drift of Current Financial and Economic Opinion

CONSUMPTION apparently continues to be maintained at a better level than production, according to an analysis by Harvard Economic Society, and "new construction projects have been in larger volume. . . . Money conditions remain wholly favorable to business improvement; and the conflicting movements within business itself are characteristic of the period of stabilization and readjustment leading to recovery."

Stocks Believed Dwindling

That we are fast using up our stocks of goods—not merely the "statistical" stocks in producers' hands, but also and to a greater degree the more elusive holdings of retailers and consumers—is a view emphasized by the National City Bank of New York, which concludes: "Sooner or later the time must come when industry will have to speed up again to care for the wants of 120 million people, and the record of industry in this country does not contain many long-drawn-out depressions."

What has held us back so long in starting the up-grade, the Bank believes, is the fact that we have failed to appreciate the extent of essential interdependence of world trade. Depression impaired our buying power, reduced our imports, affected foreign purchasing power —much more dependent on exports than ours—and caused more acute distress in many of our foreign markets than we have experienced. And our export trade, small though it be in comparison with our domestic market, is of that "marginal" quality which economists regard as one basis for profits and prosperity.

Looks for an Early Upturn

Opining that curtailment of production in June and July "may be expected to prepare the way for an upturn in August, which will be supported during the autumn by anticipation of a good year in 1931," *Business Week* repeats its good omen of a week ago. "Purchasing power of the consumer public has not been greatly decreased," it says, which "helps to explain the continued high level of general trade in face of a drastic curtailment of production. Such a situation is an irresistible stimulus to recovery." The same factor of reduced stocks cited above is brought out here by the statement that general trade has receded, on the average, less than half as much, in the past six months, as productive activity.

Doubts Return to 1929 Scale of Profits

A writer in *Annalist* expresses the belief that "profits in general will not be restored, for a considerable number of years, if ever, to the level 'satisfactory' in 1929."

Extreme pessimism, such as that now so prevalent, is regarded by Alexander Hamilton Institute as "one of the encouraging signs pointing to the beginning of a business revival . . . just as overoptimism has always preceded a slump."

We "cannot maintain wages at the present dollar values in a world where price levels have dropped radically," thinks LaSalle Extension University. It points to a drop of 9 per cent in the general wholesale index and says: "If the general level of living costs were to drop by as much as 9 per cent, without a doubt wage scales would have to be adjusted."

Prices Expected to Go Lower

There is a widespread disposition to expect and predict lower prices, though "quotations must be very near the irreducible minimum," writes Theodore H. Price. And the forecast of the Regional Shippers' Advisory Boards is that the third quarter will call for 11.9 per cent fewer cars for iron and steel movement than last year, and 14.3 per cent fewer for machinery and boilers. But confidence in definite improvement in conditions within the next six months is expressed by widely scattered representatives of the Universal Atlas Cement Co., of whom 124 predicted either "better" or "no change" and only 39 said "worse."

A detached view is noted in *Economist*, London, which says, at the end of a long analysis: "America must make up her mind to a longer period of convalescence than was anticipated. If cotton and grain crops are only moderate, her recovery may be easier. But should 1930 prove a first-class harvest year, as seems probable, the worst of her troubles may yet be ahead."

Promise Renewed Activity in Government Building

WASHINGTON, July 8.—Progress reports for the first half of the year are favorable to the successful carrying out of the plans of the Treasury Department for public building construction in 1930, to be expedited to the fullest extent possible in line with President Hoover's announced policy regarding unemployment.

Secretary of the Treasury Mellon has issued a statement explaining that the program formulated at that time contemplated the placing under contract during the present year of approximately $92,000,000 worth of construction in addition to the $40,000,000 under contract at the beginning of the year. Since Jan. 1, Secretary Mellon said, 39 additional contracts have been awarded, amounting to nearly $28,000,000 and distributed over 26 States, the District of Columbia and Hawaii. During this same period over 3800 contracts were awarded for repair, remodeling, equipment and miscellaneous projects aggregating over $4,480,000.

A similar amount is estimated to be placed under contract from July to Dec. 31. In addition, contracts have been or will be made within 30 days with private architects for complete plans for a limited number of monumental buildings, the total limits of costs of which amount to $70,000,000. It is expected that of this group plans will be completed for at least $30,000,000 worth of construction before the end of the calendar year.

The estimated output of the office of the supervising architects of the Treasury for the next six months is 71 projects with authorized limits of costs totaling $55,735,500. All of these projects are expected to be placed under contract before the end of the year.

The present status of the 71 projects is as follows: Bids receiving attention, four; on the market for bids, 10; plans completed and to be placed on the market during July, 14; plans well advanced but not completed, 43. These contracts will be distributed over 39 States.

For the electrical equipment of its new billet mill at Donora, Pa., the American Steel & Wire Co. has purchased from the General Electric Co. a 4000 and a 5000-hp. synchronous motors, two motor-generator sets and switchboard equipment.

Large Decline in Iron Output in June

Loss in Daily Rate of 6479 Tons or 6.2 Per Cent— Loss of 20 Active Furnaces

ACCORDING to actual returns from every furnace active during June, the preliminary estimated data, collected by wire on July 1 and published in THE IRON AGE July 3, were practically correct. Actual data vary only 26 tons per day from the estimate.

Production of coke pig iron in June was 2,934,129 gross tons or 97,804 tons per day for the 30 days. Estimates last week made the daily rate 97,830 tons. The June output contrasts with 3,232,760 tons or 104,283 tons per day for the 31 days in May. The decline in daily rate for June was therefore 6479 tons or 6.2 per cent. This contrasts with a decline of 1.7 per cent in May from April. The June rate is the smallest since January when it was 91,209 tons per day. A year ago the daily rate was 123,908 tons. The June daily rate this year is the smallest for that month since June, 1925, when it was 89,115 tons.

First Half Year Comparisons

Output for the first half was 18,261,312 tons, which is 15.7 per cent less than the 21,640,960 tons in the first half of 1929. It is only 1.4 per cent under the 18,520,921 tons to July 1, 1928. It is necessary to go back to the first half of 1924 to find a total for that period less than the record to July 1 this year; it was 17,434,492 tons that year.

There were 20 furnaces blown out or banked during June and none blown in, duplicating the record for December, 1929. In May the net loss was only three stacks. In the second quarter there has been a net loss of 25 furnaces against a net gain in the first quarter of 28.

Operating Rate on July 1

For the 160 furnaces active on July 1, the operating rate is estimated at 92,590 tons per day. This com-

Daily Average Production of Coke Pig Iron in the United States by Months Since Jan. 1, 1926—Gross Tons

	1926	1927	1928	1929	1930
Jan.	106,974	100,123	92,573	111,044	91,209
Feb.	104,408	105,024	100,004	114,507	101,390
Mar.	111,032	112,366	103,215	119,822	104,715
Apr.	115,004	114,074	106,183	122,087	106,062
May	112,304	109,385	105,931	125,745	104,283
June	107,844	102,988	102,733	123,908	97,804
½ year	109,660	107,351	101,763	119,564	100,891
July	103,978	95,199	99,091	122,100	.....
Aug.	103,241	95,073	101,180	121,151	.....
Sept.	104,543	92,498	102,077	116,585	.....
Oct.	107,553	89,810	108,832	115,745	.....
Nov.	107,890	88,279	110,084	106,047	.....
Dec.	99,712	86,960	108,705	91,513	.....
Year	107,043	99,266	103,382	115,851	.....

Pig Iron Production by Districts, Gross Tons

	June (30 days)	May (31 days)	April (30 days)	March (31 days)
New York and Mass.	215,442	215,704	225,752	219,033
Lehigh Valley	69,996	76,699	85,179	93,999
Schuylkill Valley	37,911	46,752	53,216	64,727
Lower Susq. and Lebanon Valley	22,503	42,915	43,173	38,984
Pittsburgh district	647,557	677,743	663,679	670,100
Shenango Valley	67,861	72,570	67,106	68,309
Western Pennsylvania	75,140	106,875	120,415	124,410
Maryland, Va. and Ky.	97,980	112,233	120,786	133,005
Wheeling district	149,070	168,365	156,170	116,715
Mahoning Valley	255,071	280,193	264,319	282,667
Central and North'n Ohio	276,722	284,849	275,700	313,805
Southern Ohio	48,279	48,264	48,463	49,410
Illinois and Indiana	620,941	719,328	682,171	694,759
Mich., Minn., Mo., Wis., Colo. and Utah	125,598	144,381	140,186	129,392
Alabama	222,330	234,289	233,972	245,875
Tennessee	1,728	1,600	1,581	981
Total	2,934,129	3,232,760	3,181,868	3,246,171

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works Iron	Merchant Iron*	Total
June, 1929	99,993	23,915	123,908
July	98,044	24,056	122,100
August	98,900	22,251	121,151
September	95,426	21,159	116,585
October	93,644	22,101	115,745
November	83,276	22,771	106,047
December	68,152	23,361	91,513
January, 1930	71,447	19,762	91,209
February	81,580	19,810	101,390
March	83,900	20,815	104,715
April	85,489	20,573	106,062
May	84,310	19,973	104,283
June	77,883	19,921	97,804

*Includes pig iron made for the market by steel companies.

Coke Furnaces in Blast

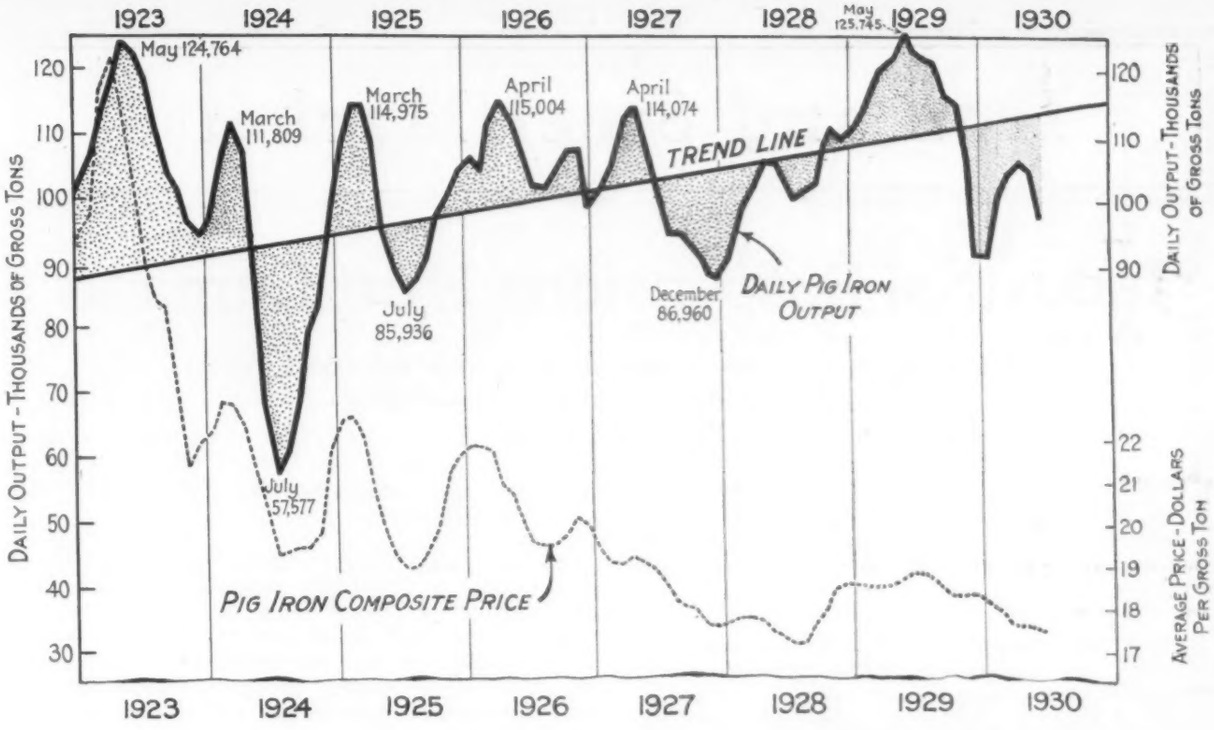
Furnaces	July 1 Number in Blast	July 1 Rate of Operation	June 1 Number in Blast	June 1 Rate of Operation
New York:				
Buffalo	11	6,185	11	5,875
Other N. Y. and Mass.	2	515	3	1,080
New Jersey	0	....	0	....
Pennsylvania:				
Lehigh Valley	5	2,330*	5	2,225*
Schuylkill Valley	3	1,260	3	1,510
Susquehanna Valley	1	450	2	1,290
Ferromanganese	1	95	1	95
Lebanon Valley	0	....	0	....
Ferromanganese	0	....	0	....
Pittsburgh District	31	20,870	32	21,230
Ferro. and Spiegel	3	475	3	510
Shenango Valley	4	2,260	4	2,345
Western Pennsylvania	3	1,700	6	3,070
Ferromanganese	2	255	2	380
Maryland	4	2,635	4	2,800
Wheeling District	7	4,670	8	5,430
Ohio:				
Mahoning Valley	13	7,740	15	9,515
Central and Northern	14	8,750	16	9,600
Southern	4	1,610	4	1,555
Illinois and Indiana	26	19,050	32	22,400
Mich., Wis. and Minn.	6	2,935	6	2,960
Colo., Mo. and Utah	3	1,250	3	1,310
The South:				
Virginia	1	250	1	260
Kentucky	1	380	1	380
Alabama	14	6,870	16	7,470
Ferromanganese	0	....	1	85
Tennessee	1	55	1	50
Total	160	92,590	180	103,425

*Includes spiegeleisen.

Production of Coke Pig Iron in United States by Months Beginning Jan. 1, 1928—Gross Tons

	1928	1929	1930
Jan.	2,869,761	3,444,370	2,827,464
Feb.	2,900,126	3,206,185	2,838,920
Mar.	3,199,674	3,714,473	3,246,171
Apr.	3,185,504	3,662,625	3,181,868
May	3,283,856	3,898,082	3,232,760
June	3,082,000	3,717,225	2,934,129
½ year	18,520,921	21,640,960	18,261,312
July	3,071,824	3,785,120	.....
Aug.	3,136,570	3,755,680	.....
Sept.	3,062,314	3,497,564	.....
Oct.	3,373,806	3,588,118	.....
Nov.	3,302,523	3,181,411	.....
Dec.	3,369,846	2,836,916	.....
Year*	37,837,804	42,285,769	.....

*These totals do not include charcoal pig iron. The 1929 production of this iron was 138,193 gross tons.



Daily Production So Far in 1930 Averages Nearly 11 Per Cent Under Theoretical Needs

Inclined line represents the gradually increasing theoretical needs of the country, ascertained by a balancing of the ups and downs in production. It shows an average yearly increase in consumption of about 1,275,000 tons

pares with 103,425 tons daily for the 180 furnaces blowing on June 1.

Of the 20 furnaces shut down last month, nine were independent steel company stacks, eight belonged to the Steel Corporation, with three classed as merchant furnaces. The net loss in steel-making furnaces was 17.

Furnace Changes During June

No furnaces were blown in during June. The following furnaces were blown out or banked: One Port Henry furnace in New York; one furnace at the Steelton plant of the Bethlehem Steel Corporation in the Susquehanna Valley; one Eliza furnace of the Jones & Laughlin Steel Co. in the Pittsburgh district; two furnaces at the Cambria plant of the Bethlehem Steel Corporation and the Perry furnace in western Pennsylvania; one Hazelton furnace of the Republic Steel Corporation and the Cherry Valley furnace in the Mahoning Valley; one Mingo furnace of the Carnegie Steel Co. in the Wheeling district; one furnace at the Columbus works of the American Rolling Mill Co. and the Upson furnace in Central Ohio; two furnaces of the Illinois Steel Co., one Iroquois furnace and one Indiana Harbor furnace of the Youngstown Sheet & Tube Co. and two Gary furnaces in the Chicago district, and three furnaces of the Tennessee Coal, Iron & Railroad Co. in Alabama.

The June production of ferromanganese was 27,327 tons, which is the third largest this year. The May output was 30,296 tons.

Possibly Active Furnaces Reduced

Riverside furnace No. 1 of the Wheeling Steel Corporation was dismantled last month. The number of possibly active stacks in the United States is therefore reduced from 315 to 314.

Production of Steel Companies for Own Use—Gross Tons

	Total Pig Iron Spiegel and Ferromanganese			Ferromanganese*		
	1928	1929	1930	1928	1929	1930
Jan.	2,155,133	2,651,416	2,214,875	22,298	28,208	27,260
Feb.	2,274,880	2,498,901	2,284,234	19,320	25,978	21,310
Mar.	2,588,158	2,959,295	2,600,980	27,912	24,978	23,345
Apr.	2,555,500	2,826,028	2,564,681	18,405	22,413	27,777
May	2,652,872	3,105,404	2,613,628	29,940	25,896	30,296
June	2,448,905	2,999,798	2,304,223	32,088	33,363	27,327
½ year	14,675,448	17,040,842	14,582,621	149,963	160,836	157,325
July	2,464,896	3,039,370	.....	32,909	31,040	.....
Aug.	2,561,904	3,065,874	.....	24,583	28,461	.....
Sept.	2,477,695	2,862,799	.....	22,278	27,505	.....
Oct.	2,729,589	2,902,960	.....	23,939	31,108	.....
Nov.	2,654,211	2,498,291	.....	29,773	31,866	.....
Dec.	2,647,863	2,112,704	.....	28,618	28,564	.....
Year	30,211,606	33,522,840	.....	312,063	339,380	.....

*Includes output of merchant furnaces.

Large Aircraft Exports

WASHINGTON, July 8.—Total exports of aircraft, engines and parts, exclusive of tires, during the first five months of 1930 were valued at $3,591,357, as compared with $4,000,071 during the corresponding period of 1929, according to Leighton W. Roberts, chief of the Aeronautics Trade Division, Department of Commerce.

May, 1930, which helped swell the total for this year, was the record month for all time with aeronautic exports valued at $1,391,159. The previous peak month was June, 1929, when exports of these items amounted to $1,174,721. During the latter month only 49 complete aircraft, valued at $955,879, were included, as compared with 58, valued at $867,918, in May of the present year. The average unit value of aircraft exported during the first five months of 1930 was $15,200 as compared with $16,650 last year.

Iron and Steel Markets

Industrial Suspensions Hurt Demand

Shutdowns by Automobile and Other Plants Adversely Affect Steel and Pig Iron Shipments—Valley Pig Iron Off 50c.

IRON and steel demand has not recovered the ground lost during the holiday interruption, and it will take a week or two before the volume of current business can be gaged. Immediate prospects are not promising.

Many consuming plants are still shut down for inventory, and suspensions among automobile and automotive parts makers will last two weeks or longer. The Ford Motor Co. will stop operations from July 11 to 28 and has cut off all shipments of steel. Railroad car builders are reaching the end of their orders, three shops in the Chicago district having shut down, with others running at 25 to 40 per cent of capacity. Operations of farm equipment plants have reached the lowest point of the year. Western rail mills are now on a 25 per cent basis and have little remaining tonnage to roll.

Steel ingot production, after the sharp reduction in operations following last Thursday, now averages 56 per cent of capacity, compared with 60 per cent at the beginning of last week. Recovery in mill operations has been most marked in plants making line pipe, which have been stepped up sharply to an 80 to 90 per cent rate. Tin plate output again averages 70 per cent, and plate production in the Chicago district has rebounded as a result of demands from the Milwaukee maker of electrically welded pipe. Shipments are moving forward to the Wisconsin pipe shop at the rate of 55,000 tons a month.

Backlogs in pipe steel and tin plate, plus good commitments in reinforcing bars and a large volume of pending structural steel tonnage, are counted on to hold steel production within a few points of the present rate until general improvement in demand sets in.

The past week's fabricated structural steel contracts, in spite of the holiday interruption, called for 16,000 tons, the smallest, however, since the second week in January. There seems to be every indication that the rate of awards in May and June will be maintained if not exceeded. June lettings in the New York metropolitan district aggregated nearly 50,000 tons, compared with 58,000 in May, the largest monthly total to date this year.

Referendum approval has been given by voters of Chicago to a 10-year traction program to cost $300,000,000. The plans call for 500 000 tons of structural and reinforcing steel, 110 miles of new track and 2000 cars.

A large radio plant is steadily adding to its force and expects to have 6000 employees making 7000 receiving sets a day by Aug. 1. The low current levels of materials prices and the favorable terms under which labor can now be hired are believed to have been more important factors in determining this program than the immediate outlook for the sale of the product.

Scrap prices show little further change and appear to be approaching a stalemate. Heavy melting grade is unchanged at Pittsburgh, Chicago and Philadelphia, but is off 25c. a ton at St. Louis. Reduced shipments to consumers are being offset, in part at least, by sharp curtailment in the railroad and industrial production of scrap.

Pig iron prices in the Valleys and at Pittsburgh have receded 50c. a ton, after having held at the same level for more than a year. The reduction was due mainly to an invasion of the district by furnaces in other producing centers. Prices at Cleveland furnaces on shipments into competitive districts have declined from $18 to $17.50. Pig iron shipments this month will be adversely affected by suspensions, particularly the two-week shutdowns of foundries serving the automobile industry.

Finished steel prices, although sensitive in proportion to the current need for tonnage, have undergone no further important changes. Mills are showing an increasing disposition to offer a single price for combination orders of plates, shapes and bars.

The June showing in steel ingots was similar to that of pig iron reported a week ago. The decline in the daily rate of output from May was 7.7 per cent. Total production for the half year, 23,793,199 tons, was 18 per cent lower than in 1929, but was the largest for any similar period prior to 1926 and closely approached the figure for the first six months of 1927.

Zinc, at 4.10c., East St. Louis, is at the lowest price in ten years. Copper has again fallen to 11.50c., delivered Connecticut valley, the lowest level since August, 1921.

THE IRON AGE composite price for pig iron has declined from $17.42 to $17.25 a gross ton, a new low for the year. Finished steel remains at 2.185c. a lb.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

	July 8, 1930	July 1, 1930	June 10, 1930	July 9, 1929
Pig Iron, Per Gross Ton:				
No. 2 fdy., Philadelphia	$19.76	$19.76	$19.76	$21.76
No. 2, Valley furnace	*18.00*	18.50	18.50	18.50
No. 2 Southern, Cin'ti	16.69	16.69	16.69	18.19
No. 2, Birmingham	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*	18.00	18.00	18.50	20.00
Basic, del'd eastern Pa.	18.75	18.75	18.75	20.25
Basic, Valley furnace	*18.00*	18.50	18.50	18.50
Valley Bessemer, del'd P'gh.	*20.26*	20.76	20.76	20.76
Malleable, Chicago*	18.00	18.00	18.50	20.00
Malleable, Valley	*18.50*	19.00	19.00	19.00
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	94.00	105.00
Rails, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	31.00	31.00	31.00	35.00
Sheet bars, Pittsburgh	31.00	31.00	31.00	35.00
Slabs, Pittsburgh	31.00	31.00	31.00	35.00
Forging billets, Pittsburgh	36.00	36.00	37.00	40.00
Wire rods, Pittsburgh	36.00	36.00	36.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.85
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.65	1.65	1.75	1.95
Bars, Chicago	1.75	1.75	1.85	2.05
Bars, Cleveland	1.75	1.75	1.75	1.95
Bars, New York	1.98	1.98	2.08	2.29
Tank plates, Pittsburgh	1.65	1.65	1.70	1.95
Tank plates, Chicago	1.75	1.75	1.80	2.05
Tank plates, New York	1.93	1.93	1.93	2.22½
Structural shapes, Pittsburgh	1.65	1.65	1.70	1.95
Structural shapes, Chicago	1.75	1.75	1.80	2.05
Structural shapes, New York	1.90½	1.90½	1.90½	2.19½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.30
Hot-rolled strips, Pittsburgh	1.65	1.65	1.70	1.90
Cold-rolled strips, Pittsburgh	2.45	2.45	2.45	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

	July 8, 1930	July 1, 1930	June 10, 1930	July 9, 1929
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.55	2.55	2.55	2.85
Sheets, black, No. 24, Chicago dist. mill	2.65	2.65	2.65	3.05
Sheets, galv., No. 24, P'gh	3.15	3.15	3.20	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.25	3.25	3.30	3.80
Sheets, blue, No. 13, P'gh	2.15	2.15	2.15	2.35
Sheets, blue, No. 13, Chicago dist. mill	2.25	2.25	2.25	2.45
Wire nails, Pittsburgh	2.05	2.05	2.15	2.65
Wire nails, Chicago dist. mill	2.15	2.15	2.20	2.70
Plain wire, Pittsburgh	2.30	2.30	2.30	2.50
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.55
Barbed wire, galv., P'gh	2.80	2.80	2.80	3.30
Barbed wire, galv., Chicago dist. mill	2.85	2.85	2.85	3.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$14.75	$14.75	$15.25	$18.50
Heavy melting steel, Phila.	12.50	12.50	13.00	16.50
Heavy melting steel, Ch'go	12.00	12.00	12.00	14.75
Carwheels, Chicago	13.50	13.50	13.50	14.00
Carwheels, Philadelphia	14.50	14.50	14.50	16.50
No. 1 cast, Pittsburgh	13.50	13.50	14.25	15.50
No. 1 cast, Philadelphia	13.00	13.00	14.00	16.50
No. 1 cast, Ch'go (net ton)	12.00	12.00	12.75	14.50
No. 1 RR. wrot., Phila.	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	10.00	10.00	10.50	13.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.50	$2.75
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	12.12½	12.12½	13.12½	18.12½
Electrolytic copper, refinery	*11.85*	11.75	12.75	17.75
Tin (Straits), New York	29.75	30.05	30.37½	45.12½
Zinc, East St. Louis	4.10	4.10	4.60	6.70
Zinc, New York	4.45	4.45	4.95	7.05
Lead, St. Louis	5.15	5.15	5.40	6.70
Lead, New York	5.25	5.25	5.50	6.90
Antimony (Asiatic), N. Y.	7.00	7.00	7.10	8.50

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

PITTSBURGH

Look to Maintain Present Operations for Two Months—Pig Iron Lower

PITTSBURGH, July 8.—With the holiday last week eliminated as an excuse for low steel operations in this and nearby districts, conditions show no marked change. Tin mill schedules are slightly higher, but otherwise finishing mills are running at about the same rate as was the case at the beginning of the month. Another possible exception might be made in the case of pipe units on which output is being stepped up steadily as deliveries begin on heavy line pipe projects.

Open-hearth furnaces in the district average about 60 per cent of capacity, with some of the smaller companies engaged at a much lower rate. Bessemer production is comparatively higher because of the requirements of pipe mills, although open-hearth steel is being used this year in a larger percentage of pipe than has been the case in the past.

The automobile industry is still responsible for the most drastic cut in steel shipments this month. Michigan plants are now beginning to suspend operations for inventory taking and model changes and, although plans of most companies call for a period of only two weeks inactivity, some of them are definitely considering a longer suspension. It is also extremely unlikely production schedules on new models will be as high as the output maintained during the spring, and the fact that the two largest interests are making no important model changes would preclude any possibility of capacity output on their part before fall.

Other steel-consuming industries are also taking advantage of mid-summer dullness to take inventories and make repairs, and releases on steel for July shipment are exceptionally light. Nevertheless, the opinion persists among steel men in this territory that business is at its low point, and that the requirements of the pipe mills, structural steel fabricating shops and reinforcing bar capacity will maintain ingot production within a few points of the present rate during the next two months. Light releases for immediate shipment continue in nearly all products, and their volume has apparently been reduced to the absolute minimum of current needs.

Steel prices have achieved a fairly stable tone, except in isolated cases. The character of current buying does not offer any incentive for making concessions, and large tonnages which are placed from time to time at prices considerably under the quoted market are usually placed very quietly and have no immediate effect upon conditions. The price structure has reached the point at which present billing prices on nearly all products are extremely unprofitable, and in many cases smaller companies are operating at a loss. It is generally understood that further open reductions would be reflected in shipments in the fourth quarter as well as in the present period, even though quotations

are nominally advanced in the meantime.

Pig iron prices have declined 50c. a ton in the Valley and at Pittsburgh, after having been maintained at the same level for more than a year. The reduction is largely due to competition of outside furnaces in both the Pittsburgh and Youngstown districts.

Pig Iron. — Prices on principal grades of pig iron have declined 50c. a ton on the basis of small sales in both the Pittsburgh and Valley districts in the last week. Cleveland furnaces have been soliciting business in this territory for two or three weeks, and a local consumer is reported to have bought 200 tons of foundry iron at a price about 50c. under the Pittsburgh delivered quotation of $19.76. In the Valleys local merchant interests have been forced to meet the Cleveland price on two or three occasions on comparatively small lots. The Westinghouse Electric & Mfg. Co. has not yet closed against its third-quarter inquiry, and delay is attributed partially to price uncertainty. Several buyers of pig iron who have been buying from hand to mouth recently, are sounding out the market for more considerable tonnages.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.00
Bessemer	18.50
Gray forge	17.50
No. 2 foundry	18.00
No. 3 foundry	17.50
Malleable	18.50
Low phos., copper free	$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$18.50
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—New buying is negligible, and specifications are generally light. Non-integrated rolling mills which depend on outside sources for their billets, slabs and sheet bars generally suspended shipments last week, but are again taking material in a limited way. With little buying to test it, the market is nominally quotable at $31, Pittsburgh, for billets, slabs and sheet bars. Forging billets take the usual differential of $5 a ton over the rerolling grade. Wire rods are holding satisfactorily, although shipments this month promise to be very light.

In nearly all products immediate shipment of small lots is the order of the day, indicating the movement of the absolute minimum of needs.

* * *

At present prices and scale of operations, some of the smaller companies are believed to be running at a loss.

* * *

Much new pipe capacity will be ready for production before Labor Day.

* * *

Open-hearth capacity in the Pittsburgh district has rebounded to the 60 per cent rate of a week ago, with Bessemer output comparatively higher.

* * *

Sheet makers are stiffening in their price stand.

Bars, Plates and Shapes.—New buying is of the hand-to-mouth character, and little significant tonnage is coming out to test the market. Activity in the structural steel market in the East is reflected in the Pittsburgh district to a slight extent, but awards to local fabricators are by no means heavy. The two largest fabricating shops in the district are maintaining a fair rate of operations, while the smaller interests are not more than 50 per cent engaged. Barge buying is also negligible, although a definite shortage of barges exists on the rivers, and it is estimated that 25 to 50 new river craft will have to be built to take care of the increased shipping needs. Some of this demand is attributable to the higher short-haul freight rates which went into effect May 20, but heavy shipments of pipe to the South and Southwest this summer have also increased demand.

Reinforcing bars are still active, and the larger makers are well booked for several weeks. Shipments have not fallen behind this year as they did last because mills have not been heavily committed on soft steel bars. Demand for the latter product is particularly quiet, and alloy bars are also very dull.

The base price on alloy bars is well maintained at 2.65c., Pittsburgh. Shapes and plates are now generally quotable at 1.65c. to 1.70c., Pittsburgh, and only the smaller buyers are forced to pay the higher price. On bars 1.70c. and 1.75c. contracts stand in many instances. Extreme low prices are confined to competitive territory.

Bolts, Nuts and Rivets.—Several manufacturers plan to go down for two weeks this month for inventory purposes and because of lack of business. Present operations are on about a 50 per cent basis, but specifications have reacted to the declining demand in the automobile industry and light railroad requirements. The best feature of the market is the price structure, which is well maintained at 73 per cent off list for bolts and nuts, 70, 10 and 5 on small rivets, and $2.90 per 100 lb. on rivets ½ in. and larger.

Tubular Goods.—Following holiday interruptions, line pipe production in the Pittsburgh and Valley districts has been stepped up sharply and available capacity is now being operated at 80 to 90 per cent. Mills now under construction are rapidly being pushed to completion, and practically all the capacity now under way will be ready for commercial production before Labor Day. This includes the Christy Park and McKeesport, Pa., units of the National Tube Co. which will make electrically welded and seamless pipe, the new electric welding mill of Youngstown Sheet & Tube Co. at Brier Hill works, and the last unit of Republic Steel Corporation's electric welding plant at Youngstown. The Republic company is now making pipe up to 16 in. at its new mill, while the National Tube Co. is turning out seamless material up to 8⅝ in. at McKeesport. A number of line pipe

The Iron Age Composite Prices

Finished Steel

July 8, 1930, 2.185c. a Lb.

One week ago	2.185c.
One month ago	2.214c.
One year ago	2.412c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1930	2.362c., Jan. 7;	2.185c., June 24
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

July 8, 1930, $17.25 a Gross Ton

One week ago	$17.42
One month ago	17.50
One year ago	18.54

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1930	$18.21, Jan. 7;	$17.42, June 24
1929	18.71, May 14;	18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.75c.
F.o.b. Chicago	1.75c. to 1.85c.
Del'd Philadelphia	1.94c. to 2.04c.
Del'd New York	1.98c. to 2.08c.
F.o.b. Cleveland	1.70c. to 1.75c.
F.o.b. Lackawanna	1.75c. to 1.85c.
F.o.b. Birmingham	1.90c.
C.i.f. Pacific ports	2.25c.
F.o.b. San Francisco mills	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft.	1.65c. to 1.75c.
F.o.b. P'gh mills, cut lengths	1.90c. to 2.00c.
F.o.b. Birmingham, mill lengths	1.90c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.65c. to 1.70c.
F.o.b. Chicago Heights mill	1.75c.
Del'd Philadelphia	1.94c. to 1.99c.

Iron

Common iron, f.o.b. Chicago	1.90c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.70c.
F.o.b. Chicago	1.75c. to 1.80c.
F.o.b. Birmingham	1.90c.
Del'd Cleveland	1.83½c. to 1.88½c.
Del'd Philadelphia	1.85½c. to 1.90½c.
F.o.b. Coatesville	1.75c. to 1.80c.
F.o.b. Sparrows Point	1.75c. to 1.80c.
F.o.b. Lackawanna	1.75c. to 1.80c.
Del'd New York	1.93c. to 1.98c.
C.i.f. Pacific ports	2.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.65c. to 1.70c.
F.o.b. Chicago	1.75c. to 1.80c.
F.o.b. Birmingham	1.90c.
F.o.b. Lackawanna	1.75c. to 1.80c.
F.o.b. Bethlehem	1.75c. to 1.80c.
Del'd Cleveland	1.83½c. to 1.88½c.
Del'd Philadelphia	1.76c. to 1.81c.
Del'd New York	1.90½c. to 1.95½c.
C.i.f. Pacific ports	2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.75c.
Wider than 6 in., P'gh	1.65c.
6 in. and narrower, Chicago	1.85c. to 1.90c.
Wider than 6 in., Chicago	1.75c. to 1.80c.
Cooperage stock, P'gh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.45c. to 2.55c.
Strips, Cleveland	2.45c. to 2.55c.
Strips, del'd Chicago	2.73c.
Strips, Worcester	2.60c. to 2.70c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.70c. to 3.80c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.05 to $2.25
Cement coated nails	2.05 to 2.25
Galvanized nails	4.15 to 4.25

	Base per Lb.
Polished staples	2.60c. to 2.70c.
Galvanized staples	2.85c. to 2.90c.
Barbed wire, galvanized	2.80c. to 2.90c.
Annealed fence wire	2.30c. to 2.40c.
Galvanized wire, No. 9	2.75c. to 2.85c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.30c.
Spring wire	2.30c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.15 to $2.25 (keg)
Annealed fence wire	2.40c. to 2.50c. (lb.)
Bright hard wire to manufacturing trade	2.35c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh	2.00c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.10c.
No. 10, blue annealed, del'd Phila.	2.32c. to 2.42c.
No. 10, blue annealed, B'ham	2.15c. to 2.20c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.15c.
No. 13, f.o.b. Chicago dist.	2.25c.
No. 13, del'd Philadelphia	2.44c.
No. 13, blue annealed, B'ham	2.30c. to 2.35c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.80c. to 1.90c.
No. 13 gage, f.o.b. P'gh	1.95c. to 2.05c.

(Usual range 24 in. to 48 in. wide)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.55c.
No. 24, f.o.b. Chicago dist. mill	2.65c.
No. 24, del'd Philadelphia	2.84c.
No. 24, f.o.b. Birmingham	2.70c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh	3.70c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.15c. to 3.20c.
No. 24, f.o.b. Chicago dist. mill	3.25c. to 3.30c.
No. 24, del'd Cleveland	3.33½c. to 3.38½c.
No. 24, del'd Philadelphia	3.44c. to 3.49c.
No. 24, f.o.b. Birmingham	3.35c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c. to 2.85c.
No. 28, f.o.b. Chicago dist. mill	2.90c. to 3.00c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.60c.

Long Ternes

No. 24, 8 lb. coating, f.o.b. mill	3.65c. to 3.75c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.80c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.30
15-lb. coating I.C.	12.90
20-lb. coating I.C.	14.00
25-lb. coating I.C.	$15.20
30-lb. coating I.C.	16.00
40-lb. coating I.C.	17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49½	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2½ in.	13
3¼ in.—3¾ in.	54	2¾ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3½ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	32	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

projects are still in the offing, but few of them are certain to be placed this year. Standard pipe is still quiet, and mechanical and boiler tubing are in light demand.

Wire Products.—Demand has fallen off again following a brief period of activity at the beginning of the new quarter. Specifications for manufacturers' wire from the automobile industry have reacted especially, although other consuming lines are very dull. The merchant trade is not disposed to make future commitments, and many contracts made carry a price guarantee clause. Nail prices are still holding in the immediate territory at $2.15, Pittsburgh, although conditions in other parts of the country are chaotic. One and two-dollar differentials are commonly given to very large buyers and are not considered as indicating market weakness, but at present size of order has little to do with price in competitive territory. The price of manufacturers' wire is well maintained at 2.30c., Pittsburgh.

Sheets.—Following a rather general holiday suspension in most of the sheet mills of the district, current specifications still fail to justify more than a 50 per cent rate of production in this and nearby districts. With the automobile industry offering practically no outlet for sheet steel and promising very little tonnage for three or four weeks, prospects for the month are very slim. Shipments to the railroad car builders have fallen off, as orders have run out and agricultural implement builders are in their quiet season. Sheet steel building products have followed the general building depression this year and are taking very light tonnages. The peak of the season for electric refrigerators is past, but makers of radios are improving their schedules slightly, and in another month are expected to be in the market in a fairly large way.

Prices have not changed materially and are considered fairly steady in the country as a whole. Concessions of $1 and $2 a ton have been made on black sheets in the Cleveland and Detroit districts, and buyers in other localities are occasionally seeking lower prices. On round tonnages such figures might be quoted, but buyers show no disposition to commit themselves far into the future, and mills are just as well satisfied to book small tonnages at the full market quotations. Mills continue to quote 3.20c., Pittsburgh, on galvanized material to the trade, although jobbers are regularly getting a $1 preferential from their regular sources of supply.

Strip Steel.—The strip market differs little from that on sheets so far as specifications are concerned, although operations are scarcely as high. Hot mills are engaged this week at 40 to 50 per cent of capacity, and cold-rolling units at about 25 per cent. Releases from automobile makers are at the low point of the year, and some steel companies feel that fortnight suspensions now going into effect in the Detroit territory will be continued for longer periods. With the introduction of new models later in the summer, some buying will necessarily be done, but in the meantime the market offers little encouragement. Prices are holding very well, and apparently have reached bottom.

Cold Finished Steel Bars.—The market is very quiet, with shipments so far this month falling under June. The automobile industry is responsible for the greater part of the inactivity, although other consuming industries are specifying in very small quantities. The price is unchanged at 2.10c., Pittsburgh, and in the Detroit territory, where shading has been most common, buying is so limited that the market is being given little test.

Tin Plate.—A slight accumulation of tonnage releases in the last week enabled mills to start up Monday with a fairly good operation assured on present rolls. Production in this and nearby districts averages about 70 per cent of capacity, with one or two independent mills running full.

Coke.—Slight activity, which characterized the beginning of the quarter, has subsided, and the coke market is again very dull. Prices are unchanged, with the furnace grade holding at $2.50, Connellsville, and foundry coke quotable at $3.25 to $4.85, ovens. Occasional sales at lower figures usually represent distress tonnages or undesirable material.

Old Material.—The scrap market has been unusually quiet in the last week and in the absence of mill buying prices have not changed materially. Machine shop turnings and the blast furnace grades have again declined in an exceptionally weak market, but the heavier grades of steel are nominally quotable at the same levels as last week. Although reports of the prices brought by the Pennsylvania Railroad list are by no means definite, it is indicated that the heavy melting steel brought slightly more than $15, and it was bought directly by a mill. Dealers are shipping scrap against most of their contracts, but in most cases the tonnage is definitely restricted, and little difficulty is now being met in picking up the required material in the open market. Dealers' buying prices range from $14.25 to $15, depending on the grade of scrap desired. Hydraulic compressed sheets are very dull, and in the absence of sales are quotable on the same basis as steel.

The Baltimore & Ohio Railroad list, which closes July 14, contains 9250 tons of scrap, and the Norfolk & Western list, on which bids close July 10, contains 2900 tons.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.50 to $15.00
No. 2 heavy melting steel	13.00 to 13.50
Scrap rails	14.50 to 15.00
Compressed sheet steel	14.50 to 15.00
Bundled sheets, sides and ends	12.50 to 13.00
Cast iron carwheels	15.00 to 15.50
Sheet bar crops, ordinary	15.50 to 16.00
Heavy breakable cast	11.50 to 12.00
No. 2 railroad wrought	14.50 to 15.00
Hvy. steel axle turnings	12.50 to 13.00
Machine shop turnings	8.50 to 9.00
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	17.00 to 18.00
Railr. coil and leaf springs	17.00 to 18.00
Rolled steel wheels	17.00 to 18.00
Low phos. billet and bloom ends	19.50 to 20.00
Low phos. mill plates	17.00 to 17.50
Low phos. light grades	17.00 to 17.50
Low phos. sheet bar crops	18.00 to 18.50
Heavy steel axle turnings	12.50 to 13.00
Electric Furnace Grades:	
Low phos. punchings	17.00 to 18.00
Heavy steel axle turnings	12.50 to 13.00
Blast Furnace Grades:	
Short shoveling steel turnings	9.00 to 9.50
Short mixed borings and turnings	9.00 to 9.50
Cast iron borings	9.00 to 9.50
Rolling Mill Grades:	
Steel car axles	21.50 to 22.50
Cupola Grades:	
No. 1 cast	13.00 to 14.00
Rails 3 ft. and under	16.50 to 17.00

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.50c.
Galv. sheets (No. 24), 25 or more bundles	4.15c.
Light plates, blue annealed (No. 10), 1 to 24 plates	2.85c.
Blue annealed sheets (No. 13)	3.00c.
Galv. corrug. sheets (No. 28), per square	4.03c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 and 10 per cent off list
Machine bolts, 100 count,	60 and 10 per cent off list
Carriage bolts, 100 count,	60 and 10 per cent off list
Nuts, all styles, 100 count,	60 and 10 per cent off list
Large rivets, base per 100 lb.	$3.30
Wire, black, soft ann'l'd, base per 100 lb	$2.60 to 2.70
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg	2.45
Cement coated nails, per keg	2.65 to 2.80

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Lower Factory Wages in New York

Average weekly earnings in representative New York State factories, including all employees in both office and shop, are reported at $29.10 for May, by the State Industrial Commissioner. This is the lowest such figure since $28.79 was registered in April, 1928, and is the lowest May since 1926.

It compares with $29.45 in April, with the year's high of $29.90 in March, with $30.03 in May, 1929, and $29.19 in May, 1928. Despite its poor showing in comparison with recent months, it is higher than for any month prior to September, 1926. The peak of $30.47 was reached in September, 1929.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$31.00
Rerolling, 4-in. and under 10-in., Youngstown	31.00
Rerolling, 4-in. and under 10-in., Cleveland	31.00
Rerolling, 4-in. and under 10-in., Chicago	33.00
Forging quality, Pittsburgh	36.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$31.00
Youngstown	31.00
Cleveland	31.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$31.00 to $32.00
Youngstown	31.00
Cleveland	31.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.70c.
Universal	1.70c.
Sheared	1.70c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$36.00
Clevelnnd	36.00
Chicago	37.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	10.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed 52% manganese, from the Caucasus	28.00c. to 30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	28.00c. to 30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$14.00 to $16.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.50
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	.80 to .90
Gas slack, f.o.b. W. Pa. mines	.90 to 1.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	39.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$26.50	13%	$32.50
11%	28.50	14%	34.50
12%	30.50	15%	37.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$21.50	11%	$26.50
7%	22.00	12%	28.50
8%	22.50	13%	30.50
9%	23.00	14%	32.50
10%	24.50	15%	35.00

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.30 to $1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to 18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 55.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73
†Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh	80, 10, 10 and 5
Stove bolts in packages, Chicago	80, 10, 10 and 5
Stove bolts in packages, Cleveland	80, 10, 10 and 5
Stove bolts in bulk, P'gh	80, 10, 10, 5 and 2½
Stove bolts in bulk, Chicago	80, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland	80, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts applied on carload business.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90
F.o.b. Chicago	3.00

Small Rivets

(7/8-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

CHICAGO

Heavy Sales of Finished Steel—Ingot Operation Between 60 and 65 Per Cent

CHICAGO, July 8.—Sales of finished steel in the week now closing are the largest with one exception for any week in the last two months. Although new purchases represented a generous sprinkling of a wide variety of steel mill products, the bulk of the tonnage was in plate and bar mill products. Most of the plates ordered are for 700 miles of line pipe placed in June with the Milwaukee maker. The bar tonnage leans heavily toward the deformed product, which is in substantial demand for road work and miscellaneous building purposes. Some of the bar business represented belated third-quarter contracting by reinforcing bar warehouses.

Steel mill blast furnaces now blowing number 20 out of 36 in the district. Ingot output has climbed from the low point of the holiday week but it has not yet reached the rate sustained in the last week in June. The rate at present is in the range of 60 to 65 per cent of capacity. Opinion as to the trend of the steel market is mixed, some producers anticipating still lower output later in July.

Chicago's traction problems are a step closer to the expenditure of $300,000,000 for new construction in the next ten years. The plans call for upward of 500,000 tons of steel, 110 miles of new tracks and 2000 cars for use by the elevated lines, the subway and the surface lines.

Three car shops in this district have completed orders on hand and have been shut down. Others are operating at 25 to 40 per cent of capacity, with order books that will carry through July and part way into August. The Illinois Central has postponed purchase of 2300 cars until later in the summer.

Although one or two tractor plants have increased production slightly, the vast bulk of the farm implement trade is marking time and trying to analyze the market effects of such factors as low grain prices, limited credit available for farmers, oversupply of farm equipment in the hands of dealers and a winter wheat crop that is smaller than had been expected.

Pig Iron.—Third-quarter contracting continues to move forward in rather a listless manner. Although inquiries often appear for quantities which buyers have been accustomed to take at this time of year, still when it comes to closing these orders the quantities written into contracts are cut 50 to 75 per cent. A melter in northern Indiana has ordered 1000 tons of Northern iron, 300 tons of 8 to 9 per cent silvery iron and 300 tons of Southern iron. The silvery is reported to have been taken at about $1 below current quotations and the Southern iron was priced at $12 a ton, Birmingham.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$18.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.50
Malleable, not over 2.25 sil.	18.00
High phosphorus	18.00
Lake Super. charc'l, sil. 1.50	27.04
S'th'n No. 2 fdy.	$18.01 to 18.51
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	27.29
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—Activity in this market centers around distribution of a part cargo of English spiegeleisen, which was unloaded at Chicago late last week. Specifications for all specialties are light and there is no interest in spot purchases.

Cast Iron Pipe.—The local market has not escaped the spell of dullness, which the holidays cast over the iron and steel market. Rockford, Ill., has postponed until July 15 taking bids on 300 tons for a sewerage plant. Medina, Ohio, is reported to have placed 125 tons with a contractor who has not yet purchased the pipe. Demand from public utilities is again pointing off, following several weeks during which they had found larger use for cast iron pipe. Interest by railroads runs no higher than in the spring and early summer months. Prices that are being quoted here on 6-in. and larger-diameter pipe in small quantities range from $37 to $38 a ton, Birmingham. The freight rate to Chicago is $8 a ton.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45 to $46; 4-in., $48 to $49; Class A and gas pipe, $3 extra.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
30 to 500 tons	2.00c.
500 tons and over	1.85c.
Rail steel reinforcement	1.65c. to 1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.35c.
Flats and squares	3.85c.
Bands (⅞ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes (⅜ in. and larger)	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60 and 10
Carriage bolts	60 and 10
Coach or lag screws	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb	$3.45
Com. wire nails, base per keg	$2.30 to 2.75
Cement c't'd nails, base per keg	2.30 to 2.75

Sheets.—Prices in this market remain uncertain and weak. Output ranges between 50 and 55 per cent of capacity and the character of orders is such that it is not at all unlikely that this rate will not be sustained in the week to come. In some respects an encouraging view can be taken of the sheet situation. It is not far now to the time of year when demand for sheets usually picks up. This is especially true of the roofing trade and similar classes of work. Producers have well rounded stocks of roofing sheets and they are expecting liberal orders about Aug. 1. Jobbers are passing out sheets in small lots but in a tonnage that is fair for this time of the year. All sheet mill products can be had on short notice.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.70c.; No. 24 galv., 3.30c. to 3.35c.; No. 10 blue ann'l'd, 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Rails and Track Supplies.—Western rail mills are not now operating above 25 per cent of capacity and remaining orders are small. The time is at hand when secondary rail buying usually makes its appearance. However, no inquiries are before the trade. A number of railroads, among them several which usually buy secondary tonnages, bought rails which have not yet been put into track. Sellers sum up the situation as one which foretells scant orders between now and the time that buying starts in the fall. It is reported that the Pennsylvania will open bids this week on 19,000 pairs of splice bars and 100,000 tie plates. Of special interest in the immediate territory is the favorable action by popular vote on a traction plan for Chicago. Over 100 miles of track is to be added to existing car lines; elevated structures are to be extended and a third track is to be added to existing double track lines. This work will of necessity be spread over a number of years but in the course of time it will offer some attractive business to rail mills.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Reinforcing Bars.—As with the local steel situation in general, this division of the market is marking time in a short week. The Milwaukee Road has ordered 600 tons of reinforcing bars for a grain elevator to be erected at Milwaukee. This award covers the week's business except for a few scattered tonnages of truckload size. Inquiries are inconsequential, except for a report that figures will be asked for a grain elevator at Riverdale, Ill. The Illinois State road-

building program is well advanced as far as awards to general contractors are concerned. Orders for the necessary reinforcing bars are now reaching dealers in small lots. Most shops in this district were closed down on Friday and Saturday so that bending operations last week were not above 40 per cent of capacity. Order books, however, are of fair size and from all appearances output will hold close to 70 per cent in July and August. The price situation remains unsettled.

Bolts, Nuts and Rivets.—Several producers who shut down last week to take inventories have resumed operations. Specifications are light and stocks in the hands of sellers are of ample size and well rounded. Therefore output is being held to actual shipments, which represent about 45 per cent of capacity. Current quotations are firm in a market which affords only occasional spot orders.

Cold-Rolled Strips.—Influenced largely by the drop in production of automobiles, operations at cold-rolled strip mills have been sharply reduced to an average that is not over 25 per cent of capacity. This represents a loss of 15 to 20 points in the last three weeks. Prices are fairly well stabilized at 2.45c. a pound, Cleveland, or 2.73c. a pound delivered Chicago.

Wire Rods.—Small use by most consumers in this district is resulting in shipments being near the low point of the year. Prices are steady at $37 a ton, Chicago.

Wire Products.—June shipments, which were the lowest so far this year, appear to have pointed the way for the course of the market in July.

Operations now stand between 40 and 50 per cent which closely represents shipments, as mill stocks are not being permitted to grow, excepting in a few minor commodities. It is interesting to note that almost without exception shipments from month to month this year have run 15 to 20 per cent below the volume in the corresponding months in 1929.

Demand by the jobbing trade in the Northwest is quieter but it is still one of the most active sections of the country in this division of the market. Nail prices are still under the influence of a highly competitive situation. Prices in the local market range from $2.15 to $2.25 base, per keg.

Demand for mesh for concrete reinforcement is very active. Public utilities are buying closer and in smaller quantities. Users of magnet wire, principally the radio industry, are taking material in small quantity.

Bars.—Demand for soft steel bars shows some improvement, but the change will make little impression on the rate of output, which is about 50 per cent of capacity. Agricultural implement operations, which have been receding for several months, have now reached the low point of the year. However, several tractor plants are now operating on slightly heavier programs.

Pipe line material orders make week the second heaviest in buying in two months.

* * *

Chicago has voted for extensive transportation improvements that will take perhaps as much as 500,000 tons of steel over the next ten years.

* * *

Secondary rail buying shows no signs of materializing, though usual at about this time.

* * *

Pig iron buyers commonly order only part of quantities inquired for.

* * *

Scrap market shows indications of hitting bottom.

The alloy steel bar market is quiet. Prices are holding on orders which barely support output at 50 per cent of capacity. Shipments of rail steel bars were light during the holiday week, but specifications are steady for bars which are to be used near the middle of July. The bed industry is marking time during the show, which is now on at Chicago. Tests of prices at 1.75c. a pound, Chicago Heights, are expected to develop in the next week or ten days.

Plates.—Orders are still reaching Chicago mills for plates for 700 miles of gas line which were taken in June by the A. O. Smith Corporation. Orders of like kind now assure satisfactory plate output in July and August. Shipments are moving forward to the Milwaukee pipe shop at the rate of about 55,000 tons a month. The Lock Joint Pipe Co., Ampere, N. J., is successful bidder for furnishing material for a 19,000-ft. pipe line, 42 in. in diameter for 100-ft. head, under the Wisconsin River for the Nekoosa-Edwards Paper Co., Port Edwards, Wis. The oil storage tank market is quiet in respect to new orders, but there is still pending about 15,000 tons.

Structural Material.—Of special interest at this time in Chicago is the result of a popular vote taken July 1. It assures subway and traction system extensions which over a period of years will take between 250,000 and 500,000 tons of steel. The program calls for an expenditure of $65,000,000 in three years, $135,000,000 in the next seven years and later $100,000,000 for the completion of the program. Awards and inquiries this week were light throughout the entire Middle West.

Old Material.—Brokers are straining every effort to cover old obligations in a market in which supplies are becoming increasingly scarce. The belief is taking strong root in the trade that the bottom of prices has been reached or that variations downward will be of minor importance and that therefore this is the time to clear books of old commitments. An indication of the price situation is given by a sale of heavy melting steel to a consumer at $12.50 a gross ton delivered. The tonnage was not large but it shows that there is resistance in the price structure. Difficulties as to distress tonnages appear to be in evidence only in a few of the specialties. Railroads, in efforts to retrench, have not only curtailed gathering of scrap but have cut production through lower shop operations. This situation is having a marked effect on the volume of railroad scrap that is coming out on tracks. Hydraulic bundles are so scarce locally that a broker has been forced to bring them in from east of Chicago to meet current obligations. Cast iron borings, scarce in this market, have been taken by a consumer at $8.75 a ton delivered.

Coke.—The Chicago by-product foundry coke market is quiet both in specifications and new sales. Quotations are steady at $8 a net ton, f.o.b. local ovens.

Prices deliv'd Chicago district consumers:

Per Gross Ton	
Basic Open-Hearth Grades:	
Heavy melting steel	$12.00 to $12.50
Shoveling steel	12.00 to 12.50
Frogs, switches and guards, cut apart, and misc. rails	13.00 to 13.50
Hydraul. compressed sheets	10.50 to 11.00
Drop forge flashings	8.50 to 9.00
No. 1 busheling	9.50 to 10.00
Forg'd cast and r'l'd steel carwheels	15.00 to 15.50
Railroad tires, charg. box size	15.50 to 16.00
Railroad leaf springs cut apart	15.50 to 16.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	13.50 to 14.00
Coil springs	16.00 to 16.50
Electric Furnace Grades:	
Axle turnings	11.25 to 11.75
Low phos. punchings	13.00 to 13.50
Low phos. plates, 12 in. and under	13.00 to 13.50
Blast Furnace Grades:	
Axle turnings	9.50 to 10.00
Cast iron borings	8.00 to 8.50
Short shoveling turnings	8.00 to 8.50
Machine shop turnings	6.25 to 6.75
Rolling Mill Grades:	
Iron rails	13.00 to 13.50
Rerolling rails	14.50 to 15.00
Cupola Grades:	
Steel rails, less than 3 ft.	13.75 to 14.25
Steel rails, less than 2 ft.	14.50 to 15.00
Angle bars, steel	13.25 to 13.75
Cast iron carwheels	13.50 to 14.00
Malleable Grades:	
Railroad	13.50 to 14.00
Agricultural	12.25 to 12.75
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00
Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars	12.00 to 12.50
Iron arch bars and transoms	13.50 to 14.00
Iron car axles	24.00 to 24.50
Steel car axles	15.00 to 15.50
No. 1 railroad wrought	10.00 to 10.50
No. 2 railroad wrought	10.75 to 11.25
No. 1 busheling	7.50 to 8.00
No. 2 busheling	6.00 to 6.50
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	8.00 to 8.50
Cupola Grades:	
No. 1 machinery cast	12.00 to 12.50
No. 1 railroad cast	10.25 to 10.75
No. 1 agricultural cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Grate bars	8.50 to 9.00
Brake shoes	8.50 to 9.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

NEW YORK

Pig Iron Demand Awaits Foundry Resumptions —800-Mile Pipe Line Order

NEW YORK, July 8.—Many foundries are still shut down for inventory and until they resume operations it will be difficult to gage the extent of pig iron demand. Some sellers report a slight increase in shipping instructions and predict further improvement after melters have completed checking their stocks. On the other hand, there is no denying the fact that in some lines business is exceedingly dull, with no early prospect of a pickup. Makers of heating equipment, for example, have heavy stocks of manufactured goods and are far behind on their pig iron specifications. Meanwhile stocks are accumulating at blast furnaces. It is a well known fact that pig iron production is less responsive to changes in the volume of business than output of finished steel, since the blowing out of furnaces is so costly. However, the Port Henry, N. Y., furnace was put out July 2, and it is not unlikely that other stacks will soon be blown out.

Sales, at 5000 tons, compare with 8000 tons in the previous week and 7000 tons two weeks ago. The Thatcher Co., Newark, N. J., has entered the market for 2000 tons of No. 2 plain, and the American Locomotive Co. is inquiring for 400 tons for Schenectady, N. Y. Business still pending includes 2000 tons for the General Electric Co., 750 tons for the Worthington Pump & Machinery Corporation and 1200 tons for the Eastern Malleable Iron Co. Base prices show no change, but silicon differentials are being rather consistently waived.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91
*Buff. No. 2, del'd east. N. J.	19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	19.89

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Reinforcing Bars.—Few awards are reported and little new work is coming into the market.

Concrete bars in 40, 50 and 60-ft. lengths for mill shipment are quoted at 1.75c. to 1.85c. a lb., base Pittsburgh. Warehouse prices range from 2.44c. a lb., f.o.b. cars, New York, for carloads or larger lots to 3.25c. for the smallest tonnages.

Finished Steel.—Business has not yet recovered from the three-day holiday generally observed last week and it is too early to ascertain whether or not an upward trend in demand will become manifest in the immediate future. Seasonal influences, combined with the current business depression, have created a dull market, so dull in fact that it would seem that any change would have to be for the better.

Yet the situation is not entirely devoid of some bright spots. Structural steel awards in the metropolitan district in June, exclusive of civil engineering work, such as tunnels and bridges, are estimated by the Structural Steel Board of Trade of New York at 49,833 tons, compared with 58,431 tons in May, the highest total so far this year. The market in some of the lighter products is fairly satisfactory, being described as more active and subject to more frequent concessions than in most other sections of the country. Demand for these products, notably sheets, is distributed over a wide range of users, many of them small. While prices cannot be described as any weaker, No. 10 gage blue annealed, at 2c., Pittsburgh, and No. 13, at 2.15c., are still subject to shading of $1 to $2 a ton. On black sheets as low as 2.45c. is still being done on occasion, especially on material taking pickling extras.

Tin plate demand has been good in this district. Some producers note an improvement in specifications which they attribute to over-conservatism on the part of can companies earlier in the year. Other mills have experienced a consistently active demand since early in the spring.

The Ajax Pipe Line Co. is understood to have placed orders for 800 miles of oil pipe, requiring 70,000 tons. Shipbuilders continue to take a steady flow of plates and shapes, but ship repair yards are not particularly busy. Railroad equipment buying is at a low ebb. Plates continue to be quoted at 1.75c., Coatesville, and shapes at 1.75c., Bethlehem, with deviations from those figures reported on attractive tonnages.

Cast Iron Pipe.—Northern foundries are operating at about 70 per cent of rated capacity, despite the lack of substantial additions to the tonnage on their books. Buying is generally confined to small lots to complete contracts, but prices are being maintained with only occasional slight concessions from $37 per ton, f.o.b. foundry.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $39.90 to $40.90; 4-in. and 5-in., $42.90 to $43.90; 3-in., $49.90 to $50.90. Class A and gas pipe, $3 extra.

Warehouse Business.—Buying from stock continues limited to small lots, but prices are being maintained, with only occasional concessions on the more desirable business.

Coke.—Furnace coke continues at $2.50 to $2.60 per net ton, Connellsville, with occasional distress carloads available at about $2.40 per net ton. Foundry coke is quiet, with prices unchanged as follows:

Special brands of beehive foundry coke, $4.85 a net ton, ovens, or $8.56 delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn; by-product foundry coke, $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Old Material.—Buying prices of brokers are slightly lower on certain grades of scrap. Cast borings and borings and turnings have been bought as low as $8.50 per ton, delivered eastern Pennsylvania, and foundry grade stove plate is off 25c. per ton on recent purchases by brokers filling contracts. No. 1 heavy melting steel is quiet and unchanged in price, but it is expected that a Claymont, Del., consumer will permit resumption of shipments within the next week.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$9.00 to	$10.50
Heavy melting steel (yard)	5.75 to	6.25
No. 1 hvy. breakable cast	7.75 to	8.50
Stove plate (steel works)	6.00 to	6.50
Locomotive grate bars	6.00 to	6.50
Machine shop turnings	5.00 to	5.50
Short shoveling turnings	5.00 to	5.50
Cast borings (blast fur. or steel works)		5.00
Mixed borings and turnings		5.00
Steel car axles		17.00
Iron car axles	19.50 to	20.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	7.75 to	8.25
Forge fire		7.50
No. 1 railroad wrought	10.00 to	10.50
No. 1 yard wrought, long	9.00 to	9.50
Rails for rolling	9.50 to	10.00
Stove plate (foundry)	7.25 to	7.50
Malleable cast (railroad)	10.50 to	11.00
Cast borings (chemical)	8.50 to	9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$14.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	12.00
No. 2 cast (radiators, cast boilers, etc.)	11.50

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10)	3.40c.
Black sheets (No. 24*)	3.90c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65
1 x 30 in. and smaller	65
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65
¾ x 20 in. and smaller	65
Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

PHILADELPHIA

Two Railroads Inquire for Steel—Weakness in Heavy Products

PHILADELPHIA, July 8.—Easier prices on plates, shapes and bars have failed to develop additional business and steel mill operations are being held with some difficulty at about 55 per cent of capacity. Inquiry for shapes is slightly better than for some weeks, but prices have settled another $1 a ton and steel bar prices have declined to 1.65c., Pittsburgh, except on less than carload lots. Sheet prices, however, have not reflected this downward trend, and the market is being maintained except for the customary reductions granted to large buyers. Certain consumers of sheets in this district are slightly more active, and a Camden, N. J., radio manufacturer is adding several thousand to its personnel.

Railroad buying is still on a limited scale, except for the Norfolk & Western, which is continuing its buying activity with an inquiry for about 5000 tons of plates, shapes and bars and 800 tons of blue annealed sheets for 500 box cars of 50 tons capacity. The Pennsylvania Railroad opens bids July 9 on 100,000 tie plates and 19,000 pairs of angle bars.

Pig Iron.—Foundry iron buying continues small and $19 per ton, furnace, is generally obtained on the small orders being placed at present. A limited tonnage of Southern pig iron is still moving to consumers in eastern Pennsylvania at $12.50 per ton, furnace, or $18 per ton, on dock, Philadelphia. While certain foundries are operating at slightly higher rates than for some months, there has been no appreciable increase in the tonnage of iron being bought. About 1500 tons of floor iron bought by the Baldwin Locomotive Works is reported to have gone to a Southern furnace. Basic iron continues quiet, with consumers using heavy charges of low-priced scrap in the open-hearth.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$19.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	20.26
East. Pa. No. 1X	20.76
Basic (del'd east. Pa.)	$18.75 to 19.00
Malleable	21.25
Stand. low phos. (f.o.b. east. Pa. furnace)	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—The price has generally settled to 1.65c. per lb., Pittsburgh, or 1.94c., delivered Philadelphia, except with certain mills which are maintaining 1.75c. per lb., Pittsburgh, or 2.04c., Philadelphia, on small lots, which constitute most of the present buying.

Reinforcing Bars.—While there is substantial inquiry for reinforced concrete projects, prices on reinforcing bars continue keenly competitive. Billet steel bars have been quoted at 1.80c. to 1.85c. per lb., Pittsburgh, or 2.09c. to 2.14c. per lb., Philadelphia, with no extra for cutting to length. Rail steel bars range from 1.60c. to 1.65c. per lb., Franklin, Pa., or 1.89c. to 1.94c. per lb., Philadelphia, with no extra for cutting to length or bending.

Shapes.—Shape mills are quoting on a slightly larger tonnage of business, but prices are lacking in firmness and recent sales of shapes have been at 1.65c. per lb., f.o.b. nearest mill to consumer, or 1.71c., Philadelphia, with smaller lots at 1.70c. per lb., f.o.b. mill, or 1.76c., Philadelphia. Lower prices are not confined to the shape mills, and fabricators complain that despite fair tonnages of business on their books and more in prospect there is inadequate or no profit at the present level of their market.

Plates.—Prices have settled to 1.75c. per lb., Coatesville, Pa., or 1.855c., delivered Philadelphia. While concessions from this price are limited to the customary reductions to large, preferred buyers, it is noteworthy that on recent sales of plates, shapes and bars on a single order, 1.65c. per lb., f.o.b. mill, has applied on all three products when a substantial tonnage was involved.

Sheets.—A radio manufacturer in Camden, N. J., is preparing to enter into a production schedule of about 7000 sets a day by Aug. 1, but covered its preliminary sheet requirements some weeks ago. The Norfolk & Western will require about 800 tons of blue annealed sheets and plates for 500 box cars to be built in its own shops. Blue annealed sheets are quoted at 2.15c. per lb., Pittsburgh, or 2.44c., delivered Philadelphia, for No. 13 gage and blue annealed plates are 2c., Pittsburgh, or 2.29c., delivered Philadelphia, for No. 10 gage. These prices are being maintained firmly on the jobbing mill sizes. Black sheets are quoted at 2.55c. per lb., Pittsburgh, or 2.84c., delivered Philadelphia, but 2.50c. per lb., Pittsburgh, is being used as the base price for full finished sheets. Galvanized sheets are quoted at 3.15c. per lb., Pittsburgh, or 3.44c., delivered Philadelphia.

Imports.—In the week ended July 5, arrivals at this port consisted of 1500 tons of manganese ore from British India, 6890 tons of iron ore from Algeria and 10 tons of rolled iron from Sweden.

Old Material.—No. 1 heavy melting steel is unchanged in price. While $12.50 per ton was paid by consumers in this district on the two latest small orders for this grade, it appears doubtful that any dealer would enter into a contract for a large tonnage at less than $13 per ton. A consumer of yard grade of heavy melting steel is expected to resume accepting shipments about the middle of this month. Deliveries of No. 1 steel are being made to a Coatesville, Pa., mill, but the mill at Claymont, Del., is still delaying shipments.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$12.50 to $13.00
No. 2 heavy melting steel	10.50
Heavy melting steel (yard)	10.25
No. 1 railroad wrought	15.00 to 15.50
Bundled sheets (for steel works)	9.50
Hydraulic compressed, new	11.00 to 11.50
Hydraulic compressed, old	9.50
Machine shop turnings (for steel works)	9.00
Heavy axle turnings (or equiv.)	11.50 to 12.00
Cast borings (for steel works and roll. mill)	8.75 to 9.00
Heavy breakable cast (for steel works)	11.50 to 12.00
Railroad grate bars	10.00
Stove plate (for steel works)	10.00
No. 1 low phos., hvy., 0.04% and under	20.00
Couplers and knuckles	17.50 to 18.00
Rolled steel wheels	17.50 to 18.00
No. 1 blast f'nace scrap	8.50 to 8.75
Wrot. iron and soft steel pipes and tubes (new specific.)	12.00
Shafting	18.00 to 18.50
Steel axles	21.00 to 21.50
No. 1 forge fire	12.00
Cast iron carwheels	14.50 to 15.00
No. 1 cast	13.00 to 13.50
Cast borings (for chem. plant)	13.50 to 14.00
Steel rails for rolling	13.50 to 14.00

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.60c.
Structural shapes	2.60c.
Soft steel bars, small shapes, iron bars (except bands)	2.70c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.70c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.25c.
Steel bands, No. 12 to ¼-in. inclus.	3.00c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.70c.
†Galvanized sheets (No. 24)	4.25c.
Light plates, blue annealed (No. 10)	3.15c.
Blue ann'l'd sheets (No. 13)	3.30c.
Diam. pat. floor plates, ¼-in.	5.30c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Less Enameled Ware Shipped

WASHINGTON, July 5.—May shipments of enameled metal-ware were 290,617 doz., valued at $1,085,019, compared with 318,431 doz., valued at $1,209,026 in April, and 352,885 doz., valued at $1,309,747 in May of last year, according to reports received by the Department of Commerce from 16 manufacturers. These producers comprise approximately 80 per cent of the industry.

CLEVELAND

Automobile Suspensions Point to Poor July in Steel—Operations Up to 40 Per Cent

CLEVELAND, July 8.—The third quarter has started with a very limited demand for steel and with little change as compared with recent weeks. With shutdowns and reduced operations by leading manufacturers of automobiles, the volume of business this month is expected to fall somewhat below that of June. The effect of the shutdown by the Ford Motor Co. on July 11 is now being felt by the mills, as this company has cut off on shipments of steel. However, some of the sheet and strip mills that supply Ford will increase operations the latter part of the month.

It is stated that when the Ford company resumes July 28 it will be on a schedule of 7500 cars a day as compared with its recent 8300 schedule. The Chevrolet Motor Co. is understood to have adopted a schedule of 50,000 cars per month in July and August as compared with about 85,000 in June. Curtailment of motor car production has resulted in suspension of shipments of steel to a number of makers of automobile parts. Quite a number of metal-working plants both in and outside of the automotive field will close down for two weeks during the month.

Steel plant operations in Cleveland increased this week due to the resumption of the Otis Steel Co. after a 10-day shutdown of its steel plant and finishing mills. This company is now operating five open-hearth furnaces and other plants made no change in their rate of operation this week. The industry here is now operating at 40 per cent of ingot capacity as compared with 26 per cent last week. The only change in the steel price situation is a quite general adoption of the 1.65c., Pittsburgh, price for plates and shapes.

Local pig iron prices are lower for outside shipment. Furnaces are going to $17.50 on foundry and malleable iron in competitive markets and there are reports of a $17 price.

Pig Iron.—The recent price reduction for local delivery failed to stimulate buying and not much business came out during the week from other sections served by furnaces operated by Cleveland interests. Inquiry shows a slight gain but foundries are slow in placing contracts after sending out inquiries. Many that usually inquire for definite tonnages are now asking for prices on a range in quantities indicating that they are uncertain whether to buy for one or three months' requirements. No inquiries are for the entire last half. A large consumer of malleable iron in Kokomo, Ind., is inquiring for its third quarter requirements. Shipments this month are expected to fall off as quite a number of foundries, particularly in the motor car field, will be closed down two weeks. However, some of these have issued definite schedules for shipments to be started as soon as they resume operations. While the $18, Cleveland, price for foundry and malleable iron is being maintained for local delivery, prices are irregular for outside shipment. Quotations of $17.50 have appeared and there are reports of even a lower price. In western Ohio and northern Indiana and western Michigan $18 is usually quoted. In eastern Michigan there is a range of $18.50 to $19.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$18.00
S'th'n fdy., sil. 1.75 to 2.25	$18.51 to 19.51
Malleable	18.00
Ohio silvery, 8 per cent	25.50 to 26.50
Basic Valley furnace	18.50
Stand. low phos., Valley	26.50 to 27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

Semi-Finished Steel.—There is very little new inquiry and specifications continue light. While the recent $31, Cleveland and Youngstown, price has been named for the third quarter for sheet bars, billets and slabs, not many contracts have been closed, as quite a number of consumers have not yet taken out all the material covered by their second quarter contracts.

Strip Steel.—Some of the hot-rolled strip mills are under fair operation this week, having accumulated some orders during the holiday week shutdown. However, little new business is coming out and some shipments to the motor car industry have been deferred because of a slowing down of automobile production. The Ford Motor Co. has placed contracts with two northern Ohio rubber plants for rubber-coated running boards, the stampings for which will be made by two Cleveland stamping plants from 24-in. wide hot-rolled strip that will be supplied by several mills. Prices are steady at 1.65c., Pittsburgh, for wide and 1.75c. for narrow material. Cold-rolled strip continues very dull. The 2.45c., Cleveland, price generally applies although mills are able to get 2.55c. for some small-lot business. Fender stock ranges from 3.70c. to 3.80c., most of the business apparently going at 3.75c. to 3.80c.

Sheets.—With suspensions by the Ford Motor Co. and curtailment by a number of other motor car manufacturers, the demand for sheets is expected to be at low ebb this month. Most of the mills are operating at only about 50 per cent of capacity this week, but a few that supply the Ford company will increase operations somewhat next week against the Ford company's getting under operation July 28. On black sheets 2.45c., Pittsburgh, is still in evidence, although mills are getting 2.55c. for small lots. Quotations of 2.50c. are reported to barrel manufacturers. Auto body sheets are holding to 3.60c. and there seems to be no deviation from the regularly quoted prices on other grades.

Bars, Plates and Shapes.—While bars are still in light demand, the tonnage with some mills has improved slightly. Structural shapes are moving better than bars and plates. Activity in the latter is confined to small lots. Structural awards here include 4200 tons for the municipal stadium on which bids were very close. Inquiry is out for the Lorain Central bridge, which will take 10,000 to 11,000 tons, bids for which will be taken Aug. 6. Bars are unchanged at 1.70c. to 1.75c., Cleveland. On plates and shapes 1.65c., Pittsburgh, has become the more common price, although some mills are holding to 1.70c. for small lots.

Wire Products.—Prices are being well maintained at $2.15 a keg for nails to jobbers and $2,25 to dealers and at $2.30 for manufacturers' wire. Demand shows little change from recent weeks.

Old Material.—The local market remains almost at a standstill, as a leading consumer has not resumed taking shipments which it suspended recently when it shut down its plant. Some of the yard dealers have discontinued operations of their yards and will not resume until after the market shows more activity. Small-lot sales are being made to dealers for delivery to Valley district mills at $14 to $14.50 for heavy melting steel and $14 for compressed sheet steel. Machine shop turnings have declined 50c. a ton. Prices on other grades are largely nominal.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$12.00 to $12.50
No. 2 heavy melting steel	11.75 to 12.00
Compressed sheet steel	12.25 to 12.50
Light bundled sheet stampings	11.00 to 11.50
Drop forge flashings	10.00 to 10.50
Machine shop turnings	8.00 to 8.50
Short shoveling turnings	10.00 to 10.50
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	11.75 to 12.00
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	9.00 to 9.50
Mixed borings and short turnings	9.00 to 9.50
No. 2 busheling	8.75 to 9.00
Cupola Grades:	
No. 1 cast	15.00 to 15.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft.	18.50 to 19.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	16.00 to 16.50

BOSTON

Pig Iron and Scrap Sales Light — Steel Fabricator Makes 20 Per Cent Wage Cut

BOSTON, July 8.—With foundries in general closed from July 3 afternoon until Monday morning, pig iron sales the past week were the lightest noted in many months. Not more than 1200 tons were sold, of which 600 tons was placed by Rice, Barton & Fales, Worcester, Mass., with the Mystic Iron Works. A limited number of foundries, receiving unexpected orders for castings, placed car lot orders for spot shipment, an indication that some melters are not covered on iron requirements. No inquiries of any size are in the market.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$20.28 to $21.28
†Buffalo, sil. 2.25 to 2.75	20.78 to 21.78
•Buffalo, sil. 1.75 to 2.25	20.91 to 21.91
•Buffalo, sil. 2.25 to 2.75	21.41 to 22.41
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
•Ala., sil. 1.75 to 2.25	22.61
•Ala., sil. 2.25 to 2.75	23.11
†Ala., sil. 1.75 to 2.25	18.75
†Ala., sil. 2.25 to 2.75	19.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.
•All rail rate.
†Rail and water rate.

Fabricated Steel.—Most of the jobs figured the past week were small, but there is an increasing number of such prospects. Only two round tonnages were let and these were taken by the Palmer Steel Co. Competition among fabricators has been so keen for such a protracted period that some concerns are confronted with the problem of reducing operating expenses. One Connecticut company has announced a reduction of 20 per cent in wages. Some fabricators claim that certain steel mill interests are selling at least one fabricator steel at prices well under openly quoted prices.

Reinforcing Bars.—A New York concern was the low bidder on 2000 tons of bars for the Boston post office. Contracts have been awarded for two Boston-Worcester road jobs that will require 1500 and 1600 tons of bars, respectively, but the material probably will not be purchased until October or later. Billet steel bars are quoted: One to 5-ton lots, 3.15c. a lb., base, from stock; 6 to 99 ton lots, 2.65c.; 100 ton lots and larger, 2.55c. Rail steel bars are 2.26½c. a lb., base, delivered Boston freight rate points.

Cast Iron Pipe.—No municipality lettings for round tonnages are reported. One city south of Boston privately purchased 200 tons of 6 and 8 in., and two or three towns collectively bought 150 tons. Gloucester, Mass., has placed a contract with the C. & R. Construction Co. for water works and approximately $100,000 of pipe will shortly be placed. Wakefield, Mass., will soon be in the market for a substantial tonnage of pipe, and two Connecticut cities this week will close on a total of 900 tons. Prices quoted openly on domestic pipe are $36 to $37 a ton, foundry, for 6 in. and larger with a $3 differential on Class A and gas pipe.

Old Material.—The market was practically at a standstill the past week. No. 1 heavy melting steel at less than $9 a ton on cars shipping point has disappeared, the market today being $9 to $9.25. Chemical borings also are $9 to $9.25 a ton and in good demand but rather scarce. Some movement of steel turnings at $4.10 to $4.35 a ton is reported, and a little bundled skeleton was bought at $7.10, but the scrap market otherwise has been lifeless.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$9.00 to $9.25
Scrap T rails	8.50 to 8.75
Scrap girder rails	7.50 to 7.75
No. 1 railroad wrought	8.10 to 8.50
Machine shop turnings	4.00 to 4.35
Cast iron borings (steel works and rolling mill)	3.90 to 4.00
Bundled skeleton, long	7.00 to 7.50
Forge flashings	7.25 to 7.50
Blast furnace borings and turnings	4.00 to 4.10
Forge scrap	6.50 to 7.00
Shafting	13.00 to 13.50
Steel car axles	16.50 to 17.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	7.00 to 7.50
Rails for rolling	9.00 to 9.25
Cast iron borings, chemical	9.00 to 9.25
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$11.50 to $12.00
No. 1 machinery cast	14.00 to 14.50
No. 2 machinery cast	11.00 to 12.00
Stove plate	7.75 to 9.50
Railroad malleable	15.00 to 16.50

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	•3.55c. to 5.55c.
Squares and flats	•4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

•Including quantity differentials.

BIRMINGHAM

Operations Unchanged — Concrete Bar Bookings Alone Show Increase

BIRMINGHAM, July 8.—Third-quarter pig iron order books are being filled at a slower rate than in some years. A continued slow melt is prolonging the time when the heavy carry-over will be depleted. Some melters who have heretofore covered their requirements well ahead are buying closely and keeping stocks low. Foundries generally have indicated intentions to resume operations this week after being closed for the larger part of last week. The base price of $14 continues for all third-quarter iron to be delivered in the district.

Active blast furnaces total 15, the same as a week ago. The Woodward Iron Co. has changed its No. 2 Woodward furnace from basic to foundry iron. Of the active furnaces, eight are producing foundry iron, six basic iron and one recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.00
No. 1 fdy., 2.25 to 2.75 sil.	14.50
Basic	14.00

Finished Steel.—Demand for sheets continues to climb slowly upward and inquiries indicate it will just about reach the usual peak that comes in July. Demand for plates, bars and shapes is about the same, being considerably lighter than at this season in the past two years. Wire products and railroad accessories are experiencing the lightest demand in some time. The new quotations of 1.90c. on bars, plates, shapes, announced last week, are the lowest of the year. Several of the finishing mills that closed early last week for the holiday period will remain closed through most of this week. A wire mill and a bar mill are among those being closed for the two weeks.

Structural steel fabricators report all orders to be for less than 100 tons, for the second successive week. Inquiries have developed on some new projects of importance but fabricators express little hope of closing on them very early. Reinforcing bar bookings last week ran above the low average of recent weeks.

The total of active open-hearths remains at 14. This is eight less than the number operating one year ago.

Cast Iron Pipe.—The market has experienced a quiet week from the standpoint of new business though some important inquiries have developed. At least two important tonnages are pending from industrial sources. The projects being figured together with those just developing call for one of the heaviest tonnages in several weeks. July 17 has been set as the date for opening bids on the job that has been pending at Hattiesburg, Miss., for some time. Upward of 3000 tons of pipe will be required for this project. Nearly all shops are resuming operations today following the shutdown for the holiday on Friday. Prices are holding

firm at $37 to $38 a ton, Birmingham, for 6-in. and larger sizes.

Coke.—The movement of coke reflects light operations by foundries. Less coke was moved last week than for any other week this year. Producers continue to work 1201 ovens out of a total of 1390, but slow-coking operations are in effect at some plants.

Old Material.—Dealers are taking advantage of the lowest prices in years to round out their stocks for fall requirements. Activity on the part of consumers is centered around a few small purchases of steel scrap; heavy melting steel in the main. The unchanged quotations represent nominal values.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$12.00
Scrap steel rails	$12.50 to 13.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	20.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	14.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

ST. LOUIS

Pig Iron Buying Movement Likely by Mid-July —Scrap Lower

ST. LOUIS, July 8.—A dull pig iron market was not helped by the holiday period, which extended over several days. Melters are disinclined to talk about requirements, and little effort to sell was made by makers. Lack of business has caused a reduction in the melt in the district. With the exception of two 1000-ton inquiries, there is not much in the way of definite pig iron orders ahead. Third-quarter buying is not expected to any extent until after July 15.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$18.00 to $18.50
Malleable, f.o.b. Granite City	18.00 to 18.50
N'th'n No. 2 fdy., deliv'd St. Louis	20.16
Southern No. 2 fdy., deliv'd	17.42
Northern malleable, deliv'd	20.16
Northern basic, deliv'd	20.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel.—Buying of plates, shapes, bars and sheets, which has been light for several weeks, was quiet during the last week with its holidays. The sheet price situation is especially weak. Warehouse business continues light, although business during June showed an improvement over the preceding month, being equal to June of last year. The demand for reinforcing bars and structural steel still lags, the only inquiry pending for the former item being 268 tons for three viaducts in Forest Park, St. Louis.

Old Material.—The old material market received two further setbacks the last week. One of the largest consumers of heavy melting steel withheld shipments against contracts until July 20, and one of the largest consumers of borings and shoveling turnings served notice it would make no purchases for third quarter. Selected heavy melting steel is down 25c. Sales during the week were exceedingly light on account of the holidays. Railroad lists: Missouri-Kansas-Texas, 1440 tons, including 300 tons of wheels; Kansas City Southern, 320 tons; New York, Chicago & St. Louis, 42 carloads; Great Northern, 26 carloads; Nashville, Chattanooga & St. Louis, 13 carloads, and Chicago & Eastern Illinois, four carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$11.00 to $11.50
No. 1 heavy melting or shoveling steel	10.75 to 11.25
No. 2 heavy melting or shoveling steel	10.00 to 10.50
No. 1 locomotive tires	13.00 to 13.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	11.25 to 11.75
Railroad springs	13.25 to 13.75
Bundled sheets	7.50 to 8.00
No. 2 railroad wrought	10.75 to 11.25
No. 1 busheling	9.25 to 9.75
Cast iron borings and shoveling turnings	9.25 to 9.50
Iron rails	10.00 to 11.00
Rails for rolling	12.00 to 12.50
Machine shop turnings	6.00 to 6.50
Heavy turnings	8.50 to 9.00
Steel car axles	15.50 to 16.00
Iron car axles	24.50 to 25.00
Wrot. iron bars and trans.	14.00 to 14.50
No. 1 railroad wrought	8.50 to 9.00
Steel rails, less than 3 ft.	13.50 to 14.00
Steel angle bars	10.25 to 10.75
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	12.00 to 12.50
Railroad malleable	10.50 to 11.00
No. 1 railroad cast	11.50 to 12.00
Stove plate	10.00 to 10.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00
Agricult. malleable	10.00 to 10.50

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

CINCINNATI

New Steel Buying at 45 Per Cent of Capacity—Pig Iron Dull

CINCINNATI, July 8.—The district pig iron market continues dull and listless, with consumers entering the market only when necessary to supply immediate requirements. Total sales last week were about 3150 tons, of which 750 tons was silvery for shipment to a Michigan consumer. The only other sizable order was from a central Ohio buyer for 300 tons of Northern foundry iron. The Columbus, Ohio, furnace of the American Rolling Mill Co. has been blown out for an indefinite period. This is not expected to affect the supply of this iron, as the furnace stacked iron for sometime in anticipation of this shut down. Prices, generally, are steady, although concessions are regarded possible on substantial tonnages. A central Ohio buyer and a central Indiana consumer are in the market for 200 tons of iron each.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.89 to $21.39
Ala. fdy., sil. 1.75 to 2.25	16.69 to 17.69
Ala. fdy., sil. 2.25 to 2.75	17.19 to 18.19
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 17.69
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Coke.—With the district melt slightly lower this month than last, the movement of coke is slower than a week ago. New business is practically negligible.

Finished Material.—The market is quiet and featureless. New business is about 45 per cent of capacity with production keeping pace. Consumers are showing no interest by way of inquiry, but are placing orders as the need arises and demanding almost immediate shipment.

Old Materials.—With new business slow, district scrap dealers are buying conservatively to avoid being caught short. Dealers' quotations continue firm, although there has been no real

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.30c.
Rail steel reinforc. bars	3.15c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex.	3.80c.
Squares	4.30c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

test of prices. The Norfolk & Western Railroad is offering its usual list, on which bids close Friday.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$11.00 to $11.50
Scrap rails for melting	11.75 to 12.25
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.00 to 10.50
Cast iron borings	8.00 to 8.50
Machine shop turnings	7.50 to 8.00
No. 1 busheling	9.50 to 10.00
No. 2 busheling	6.00 to 6.50
Rails for rolling	13.00 to 13.50
No. 1 locomotive tires	13.50 to 14.00
No. 2 railroad wrought	11.00 to 11.50
Short rails	17.00 to 17.50
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	17.50 to 18.00
No. 1 railroad cast	14.50 to 15.00
Burnt cast	8.25 to 8.75
Stove plate	8.25 to 8.75
Brake shoes	8.25 to 8.75
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

Canada

Railroad Equipment Makers Fully Booked

TORONTO, July 8.—The demand for merchant pig iron is low. A number of melters have placed commitments for third-quarter delivery, but the total tonnage on this account is well under that of former quarters this year. Future buying has slowed down, and only about two sales were made during the week, while inquiries and specifications have practically disappeared. A number of melters who formerly placed quarterly iron contracts have announced their intention of buying on a hand-to-mouth delivery basis until they can see indications of betterment. Small consuming interests are coming into the market from time to time, but practically all orders are for one or two car lots.

With six blast furnaces blowing, production is being maintained at a fairly high level. Mills are beginning to cut production schedules, however, and unless there is improvement in new orders for rails, etc., the next month or six weeks will see some rather severe curtailment in mill activities. Car and locomotive builders meanwhile are maintaining close to capacity operations, with backlogs for two or three months. Pig iron prices are unchanged.

Prices per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	22.50

Imported Iron, Montreal Warehouse

Summerlee	$33.50
Carron	33.00

Old Material.—Demand for iron and steel scrap has reverted to a state bordering on stagnation, according to Toronto and Montreal dealers. No future business was reported and spot sales were confined to small tonnages. Mills are cutting down their melt and steel scrap grades are now sluggish. Foundry and other consumers of iron scrap have been buying in a listless manner for some time past, and it is believed that the immediate future will bring further curtailment. Malleable iron and stove plate received some attention, but machinery cast is moving in a dull manner. Other grades continue to move in a spotty manner, but tonnages are being reduced in current orders. The recent price changes appear to have had no stimulating effect on business. Prices are unchanged for the week.

Dealers' buying prices for old material:

Per Gross Ton

	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	10.00	8.00
No. 1 wrought	9.00	11.00
Machine shop turnings	6.00	5.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.00	6.00
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	4.00	4.00
Steel axles	10.00	13.00
Axles, wrought iron	12.00	15.00
No. 1 machinery cast	....	12.00
Stove plate	....	10.00
Standard carwheels	....	10.50
Malleable	....	10.00

Per Net Ton

No. 1 mach'ry cast	11.00	....
Stove plate	9.00	....
Standard carwheels	10.00	....
Malleable scrap	9.00	....

BUFFALO

Excellent Warehouse Business—Two More Blast Furnaces Slated to Go Idle

BUFFALO, July 8.—With foundry operation around 40 per cent, many of the plants being shut down for two or three weeks, pig iron demand has fallen to a minimum. There is very little inquiry. The most important one is for 400 tons of foundry and malleable in the central part of the state. Worthington Pump & Machinery Corporation has been buying a little iron and the General Electric inquiry is still unsatisfied. There is a volume of carload selling but very little buying ahead. Two more stacks are scheduled to be banked sometime within a week. Price is holding firm on what iron is going, but it is conceded that if the Western market weakens, it is probable that the local market will soften also.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Steel.—Operation of Buffalo district steel mills is about unchanged, with the Lackawanna plant of the Bethlehem Steel Co. operating 12 open hearth furnaces, or approximately 50 per cent. The Donner plant is operating three open hearths and other plants continue at a similar gait of operation. No sizable structural awards have been made and the reinforcing bar market is extraordinarily quiet. The bright spot in the situation is the excellent warehouse business. During the month of June warehouses had almost as heavy a month as June a year ago.

Old Material.—The market is almost absolutely dormant. There is no new buying by consuming interests, and about the only activity is on the part of dealers who took the last sizable order for $13 for No. 1 heavy melting steel.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$13.00 to $14.00
No. 2 heavy melting scrap	11.50
Scrap rails	12.00 to 12.50
Hydraulic comp. sheets	11.50 to 12.00
Hand bundled sheets	9.00 to 9.50
Drop forge flashings	11.25 to 11.75
No. 1 busheling	11.75 to 12.75
Hvy. steel axle turnings	11.50 to 12.00
Machine shop turnings	8.00 to 8.50
No. 1 railroad wrought	10.50 to 11.00
Acid Open-Hearth Grades:	
Knuckles and couplers	15.00 to 15.50
Coil and leaf springs	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Low phos. billet and bloom ends	17.00 to 17.50
Electric Furnace Grades:	
Short shov. steel turnings	10.75 to 11.00
Blast Furnace Grades:	
Short mixed borings and turnings	9.50 to 10.00
Cast iron borings	9.50 to 10.00
No. 2 busheling	7.00
Rolling Mill Grades:	
Steel car axles	16.50 to 17.00
Iron axles	19.50 to 20.00
Cupola Grades:	
No. 1 machinery cast	12.00 to 12.50
Stove plate	10.75 to 11.00
Locomotive grate bars	9.00 to 9.50
Steel rails, 2 ft. and under	16.00 to 16.50
Cast iron carwheels	13.50 to 14.00
Malleable Grades:	
Industrial	15.50 to 16.00
Railroad	15.50 to 16.00
Agricultural	15.50 to 16.00
Special Grades:	
Chemical borings	11.50 to 12.00

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.20
Black wire, base per 100 lb.	3.50

Will Make Light Weight Steel Sections

E. C. Frey, formerly general manager and treasurer of the Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., has organized a company operating under the name of the Frey Steel Products Co., to manufacture light weight sections, such as channels, angles, etc. The plant is located at Milton, Pa., and the office at 620 Lewis Tower, Philadelphia. The Pearce Fireproof Co., Philadelphia, is acting as distributer.

Millard D. Meyers, who has been rolling sections for a number of years both at Johnstown and Harrisburg, Pa., will have charge of operations.

PACIFIC COAST

SAN FRANCISCO, July 5.—(*By Air Mail*)—Movement of iron and steel products on the Pacific Coast was interrupted by the Fourth of July holiday, many plants closing down for three days. The outstanding letting involved 657 tons of cast iron pipe for Los Angeles.

A number of reinforcing bar contracts were reported placed. Included among them were 315 tons for highway work in San Diego County, California, placed with an unnamed interest, 200 tons for dormitories at Pasadena, secured by the Soule Steel Co. and 130 tons for a bridge at Prosser, Wash., taken by the Pacific Coast Steel Corporation. New inquiries call for several hundred tons, bids being taken on 300 tons for a store building at 610 South Hill Street, Los Angeles. Prices in the San Francisco district continue unchanged at 2.30c., base, on carload lots for out-of-stock material. In the Los Angeles district quotations are $2 a ton higher.

Plate bookings were all confined to lots of less than 100 tons. No award has yet been made on 2027 tons for the Bully Creek and Fairman Coulee siphons at Vale, Ore. Bids will be opened next week on 175 tons of 20-in. No. 10 gage pipe for Walla Walla, Wash. Prices range from 2.15c. to 2.25c. c.i.f.

Demand for structural material continues to show signs of improvement although awards this week were not especially heavy. The Pacific Iron & Steel Co. secured 225 tons for a transit shed at Long Beach, Cal., and the Lidgerwood Pacific Co. booked 225 tons of plates and shapes for a logging skid for the Weyerhaeuser Timber Co. at Tacoma, Wash. The general contract for four towers for the Duwamish Waterway crossing at West Michigan Street, Seattle, calling for 114 tons was placed with the General Construction Co. Bids have been opened on 200 tons for a steam power plant at Tacoma and bids will be opened July 8 on 137 tons of sheet steel piling for the U. S. Engineer Office at Sacramento, Cal. Plain shapes are holding firm at 2.25c., c.i.f.

Cast Iron Pipe.—Awards aggregated less than 800 tons. Griffith Co. took 657 tons of 6 and 8-in. Class B pipe for Los Angeles and the Pacific States Cast Iron Pipe Co. booked approximately 100 tons of 6 and 8-in. Class 150 pipe for Great Falls, Mont. Olympia, Wash., rejected all bids and then called for and opened new bids on July 3 for 425 tons of 10 and 12-in. Classes B and C or 150 pipe. Bids will be opened next week on 537 tons of 6-in. Class C pipe for Vancouver, B. C.

Steel Pipe.—Movement of standard steel pipe has shown little improvement during the past 30 days and stocks in distributers' warehouses are well rounded out. Los Angeles divided 160 tons of ¾ to 2-in. extra strong standard pipe among several interests.

Warehouse Business.—After many months of unstabilized prices in the warehouse business in the San Francisco district, distributers have finally established new quotations and these prices are now being firmly maintained. Plates, shapes and soft steel bars are now held at 3.40c., base. Blue sheets, No. 10 gage, black sheets No. 24 gage and galvanized sheets No. 24 gage are held at 3.80c., 4.35c. and 5.00c., base, respectively. Rivets are firm at 5c., and common wire and cement-coated nails at 3.35c., base.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.40c.
Black sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.00c.
Struc. rivets, ½-in. and larger	5.00c
Com. wire nails, base per keg	3.35c
Cement c't'd nails, 100 lb. keg	3.35c.

Some Activity in Concrete Bars and Structural Material

Pig Iron Prices Per Gross Ton at San Francisco

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Youngstown

Valley Operations Up After Suspensions

YOUNGSTOWN, July 7.—Following suspensions last week for the Independence Day celebration, steel companies are resuming today for a 60 per cent average operating rate. In flat-rolled steels some accumulated tonnages developed in the past week, which will be worked off.

In June the Truscon Steel Co. shipped 22,000 tons of fabricated steel from its plants, representing the fourth largest month in its history. W. C. Conger, vice-president, advises that June shipments were the largest since August, 1929, when they totaled 24,000 tons. Orders booked last month were also satisfactory, he states, and present bookings insure capacity operations over the next two months.

The Republic Steel Corporation will average 65 per cent this week; Youngstown Sheet & Tube Co., 60 per cent; Carnegie Steel Co., 58 per cent, and Newton Steel Co., 40 per cent.

Bessemer steel plants are producing at 65 per cent of capacity as a result of demands for steel from pipe mill departments. Of 51 independent open-hearth furnaces, 26 are melting; of 120 Valley sheet mills, 47 are active, against 35 last week, with the active mills operating a greater number of turns. Strip mills are running at 55 per cent rate; tin mills at 65 per cent; bar mills, 50 per cent, and pipe mills, 70 per cent.

Detroit Scrap Unchanged

DETROIT, July 8.—Scrap prices are unchanged from those which have nominally obtained over the past two weeks.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$11.00 to $11.50
Borings and short turnings	7.25 to 7.75
Long turnings	6.00 to 6.50
No. 1 machinery cast	11.25 to 11.75
Automotive cast	13.50 to 14.00
Hydraul. comp. sheets	10.50 to 11.00
Stove plate	9.00 to 9.50
New No. 1 busheling	9.75 to 10.25
Old No. 1 busheling	8.75 to 9.25
Sheet clippings	8.00 to 8.50
Flashings	9.75 to 10.25

Railroad Equipment

Peiping-Mukden (Tientsin, China), is inquiring for six locomotives of 4-6-2 type and 14 locomotives of 2-8-2 type.

Electro Metallurgical Co. has ordered one 50-ton hopper car from American Car & Foundry Co.

Rio Grande do Sul is inquiring for 39 coal cars of 30 tons capacity. Dr. Octacilio Pereira, Porto Alegre, Rio Grande do Sul, Brazil, is general manager.

American Agricultural Chemical Co. has ordered three tank cars from General American Tank Car Co.

Western Electric Co. has ordered 10 flat cars from Koppel Industrial Car & Equipment Co.

Chicago & North Western has ordered 10 flat cars from American Car & Foundry Co.

More Locomotives Delivered in June

WASHINGTON, July 5.—Railroad locomotives to the number of 81 were shipped in June, against 58 in May, according to reports received by the Department of Commerce. All except one of those shipped in June were steam units.

In the first half of the current year 419 railroad locomotives were shipped, compared with 319 in the same period of last year. This gain was wholly in domestic units, which advanced from 280 to 408, while locomotives shipped for export dropped from 39 to 11. Only six electric locomotives were delivered in the first six months, compared with 16 last year.

Unfilled orders at the end of June totaled 343 locomotives, of which 291 steam and 44 electric units were for domestic use and four steam and four electric locomotives were for foreign account.

Battelle Institute Houses Several Researches

(*Concluded from page* 91)

frigid temperatures; on centrifugal methods for rapid chemical analysis; on the attack of coal ash on boiler refractories (for the A. S. M. E.); on combustion of pulverized coal; and on low-temperature carbonization. The last named is an example of the cooperation which is possible with the neighboring Ohio State University, for the equipment was erected in its laboratories some years back, but the necessary work, which had been postponed from a number of causes, is now being carried on by the institute staff.

Japan's Steel Industry Our Best Scrap Customer

(*Concluded from page* 86)

scrap in the harbor of Osaka, Japan, were taken to justify claims made against the shipper. The material was bought as heavy cast scrap, but was found to include a considerable percentage of automobile steel and steel pipe.

Because of such incidents and other claims against material, such as short weights, the trading companies, which formerly bought scrap on terms similar to their purchases of new products, cash against shipping documents, have been forced to adopt the practice of withholding until after delivery in Japan 25 per cent of the purchase price, from which may be deducted any claims that arise from inferior material or short weights.

Largest Exports from Southwest

While steel scrap is shipped from practically every port in the United States, as well as Alaska, Hawaii and Porto Rico, shipments from Houston, Tex., are well in advance of the tonnages from other ports. In 1929, the Department of Commerce shows the scrap movement from that port to have been 123,000 tons, or more than 22 per cent of the total of all exports. Of these shipments, almost 70 per cent went to Japan. Steel scrap moves to the Houston district from several hundred miles inland, proving more profitable when exported than when shipped on the lowest freight rate to a domestic consumer. Seven railroads have terminals at Houston, so that a substantial tonnage of railroad grade of heavy melting steel is available.

The entire South and Southwest provide a fertile field for export scrap and substantial tonnages of railroad and other grades move for export, especially to Japan from railroad terminals at these ports. Such Southern Atlantic and Gulf ports as Baltimore, Mobile, Savannah, Norfolk, Jacksonville on the Atlantic and New Orleans, Tampa and Houston on the Gulf, shipped a total of almost 300,000 tons last year, or more than half the total exports of steel scrap, and of this total, more than 52 per cent moved to Japan.

Thus far the scrap trade with Japan has been largely in one grade, No. 1 heavy melting steel, but there is reason to believe that with assurances of receiving material as specified and care in avoiding short weights, the Japanese steel consumers would be willing to buy other grades of scrap used by American steel mills.

Pickling Principles in Galvanizing

(*Concluded from page* 83)

of pickling which can be standardized.

There will still be left many uncontrolled factors which will cause a large amount of trouble, expense and loss, due to defects which develop during pickling operations, or original defects which are merely uncovered, or disclosed, by pickling.

Views of Practical Men of Long Experience

A progressive pickler, discussing hydrogen and acid brittleness in steel, stated that he had found that it develops most readily with a high bath temperature, a weak acid and a long pickling time. He also contended that the same conditions are responsible for the blisters that form on galvanized sheets. The results of Mr. Sutton's experiments, and the practical experience of the writer, however, make him feel that the question of acid brittleness is one which is a combined result of steel making and pickling.

Another practical pickler, who had pickled all kinds of steel for 30 years, made the statement that "you can always pickle good, sound steel without any trouble, and, if you know how to pickle, no harmful results ever come from pickling a good, high-quality steel base." There is a lot of good common sense in that statement.

Perhaps, if more were really known about both steel making and pickling, the real cause of trouble would be found in the steel, while pickling operations merely uncover the original cause, or, with the wrong conditions to start with, develop a new set of condition which are found extremely harmful later on, in finishing operations. It is therefore well to reduce pickling operations and pickling practice to as scientific a basis as possible, using modern equipment and modern methods in every particular.

The Prest-O-Lite Co., Inc., 30 East Forty-second Street, New York, has placed in operation a new plant at Casper, Wyo., for the manufacture and distribution of dissolved acetylene. The plant is located on a private siding of the Chicago, Burlington & Quincy Railroad, and the address is 648 Bryan Stock Trail.

Government Buys 402 Airplanes

WASHINGTON, July 8.—The War Department has awarded contracts for 402 airplanes and 128 extra engines at a cost of approximately $6,000,000 and the Navy Department has contracted with the Wright Aeronautical Corporation, Paterson, N. J., for 272 air-cooled engines with spare parts for a little more than $2,000,000. The contracts were made in connection with the five-year aviation program.

The Army Air Corps awards consisted of 71 Thomas-Morse planes, to be built by the Consolidated Aircraft Corporation, Buffalo, N. Y.; 44 Douglas planes and 146 basic training planes, Douglas Co., Santa Monica, Cal.; 131 pursuit planes, Boeing Airplane Co., Seattle; 10 amphibian planes, Sikorsky Aviation Corporation, Bridgeport, Conn., and 128 air-cooled engines with spare parts to Wright Aeronautical Corporation.

To Test Properties of Zinc-Base Die Castings

A series of tests to determine all the physical characteristics of zinc-base alloys used for die castings and to provide data that will be of value to engineers who design die castings will be undertaken by H. D. Churchill, professor of mechanics, Case School of Applied Science, Cleveland, with the cooperation of A. E. Weiss, factory manager, Superior Die Casting Co., Cleveland. These tests are being sponsored by the American Die Casting Institute and Case School.

It is stated that, owing to lack of data on the subject, engineers who design die castings are at present working in the dark to a considerable extent. The results of the tests will enable them to design castings with sections that will provide the required strength without an excess of metal. It will take about two years to complete the tests.

Jones & Laughlin Program of Improvement

Including unexpended balances on appropriations for work already under way, and appropriation recently authorized, the program for improvement of plants and properties of Jones & Laughlin Steel Corporation, as of July 1, involves expenditure of approximately $20,000,000, it was stated by an officer of the corporation. No statement was made as to the extent, location or character of the proposed improvements.

The Louis Allis Co., Milwaukee, maker of electric motors, announces the opening of three sales offices, with the following men in charge: C. O. Sargent, 1715 Union Bank Building, Pittsburgh; W. Woobank, 215B East Archer Street, Tulsa, Okla., and A. R. Thomas, 4441 Santa Fe Avenue, Los Angeles.

Non-Ferrous Metal Markets

Copper Lower and Active—Tin Stagnant—Lead Steady—Zinc Weak

NEW YORK, July 8.

Because of the fourth of July holidays demand for all the metals has been very light.

Copper.—One or two producers, not satisfied with the demand from consumers at the 12c. level, in the last week reduced their quotation and have done business at 11.50c. for electrolytic copper, delivered in the Connecticut Valley. One of these sellers was a custom smelter and another is understood to be a primary producer. The rest of the producers, including the other custom smelters, have been adhering to the 12c. level. Sales, despite the holidays, are said to have been fairly large to domestic consumers up to and including today. It is expected that when these sellers are satisfied, the market will return to the quotation of 12c. which has prevailed for a week or two. Sales to foreign consumers have fallen off considerably this month, due to their natural inclination to hold back while metal is selling in this country at a level below the quotation of Copper Exporters, Inc., which still stands at 12.30c. c.i.f., usual European ports. Despite the wave of pessimism which prevails, some producers are quite well satisfied with the volume of business already booked for July shipment and state that June bookings made a very respectable showing.

Opinions vary as to the showing which June statistics will make, to be made public in about a week. One opinion is to the effect that there will be an increase of 10,000 tons in refined stocks, while others insist that there will be a small net decline. Lake copper is holding firm at 12c. to 12.12½c., delivered.

Tin.—Thus far this month there has been hardly any business done in tin. The market was virtually closed on July 3 and there has been no activity since. Prices remain fairly steady with spot Straits tin hovering around the 30c. level and quoted today at 29.75c., New York. In London prices today were about £1 per ton less than a week ago, with spot standard at £134 7s. 6d., future standard at £136 5s. and spot Straits at £136 10s. The Singapore price today was £137 15s. Stocks in London warehouses on July 5 were 22,268 tons, an increase of 48 tons over the previous week, ended June 28.

Lead.—This market is the steadiest as to price changes. Quotations are firm at 5.25c., New York, and 5.15c., St. Louis, with new business confined to carload and small lots, mostly for July shipment. The only change is that the number of these sales has increased.

Zinc.—Statistics for June were unfavorable to sellers in that they showed an increase in refined stocks of prime Western zinc of about 7000 tons for the month. During the week the market firmed up slightly to 4.15c., East St. Louis, but since the publication of the statistics weakness has again developed and today the metal is available and has been sold at 4.10c., East St. Louis, or 4.45c., New York. Demand is naturally light.

Ore prices are unchanged at $29, Joplin. Sales have been light at about 3420 tons for the week, with production last week at 6800 tons. Shipments were 7306 tons, leaving stocks at approximately 24,300 tons, slightly smaller than the week previous.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	July 8	July 7	July 3	July 2
Lake copper, New York	12.12½	12.12½	12.12½	12.12½
Electrolytic copper, N. Y.*	11.25	11.25	11.25	11.25
Straits tin, spot, N. Y.	29.75	29.87½	30.25	30.25
Zinc, East St. Louis	4.10	4.12½	4.15	4.15
Zinc, New York	4.45	4.47½	4.50	4.50
Lead, St. Louis	5.15	5.15	5.15	5.15
Lead, New York	5.25	5.25	5.25	5.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Antimony.—In a dull market Chinese metal is quoted unchanged at 7c., duty paid, New York, for spot delivery, with futures at 6.87½c.

Nickel.—Ingot nickel in wholesale lots is quoted unchanged at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 22.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, July 8.—This market was quiet during the holiday week and prices for most commodities have been easy. The old metal market is listless with quotations leaning to the weak side.

Prices per lb., in carload lots: Lake copper, 11.87½c.; tin, 30.75c.; lead, 5.25c.; zinc, 4.25c.; in less-than-carload lots, antimony, 8.25c. On old metals we quote copper wire, crucible shapes and copper clips, 9c.; copper bottoms, 8c.; red brass, 8c.; yellow

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	18.75c.
Copper, hot rolled, base sizes	21.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	24.00c.
Seamless Tubes—	
Brass	23.75c.
Copper	23.75c.
Brass Rods	17.00c.
Brazed Brass Tubes	26.25c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	10.25c. to 10.75c.
Zinc sheets, open	11.25c. to 11.75c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	32.00c. to 33.00c.
Tin, bar	34.00c. to 35.00c.
Copper, Lake	13.75c.
Copper, electrolytic	13.50c.
Copper, casting	13.75c.
Zinc, slab	6.25c. to 7.25c.
Lead, American pig	6.25c. to 6.75c.
Lead, bar	8.25c. to 8.75c.
Antimony, Asiatic	10.00c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	22.25c. to 23.25c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	35.00c.
Tin, bar	37.00c.
Copper, Lake	13.13c.
Copper, electrolytic	13.13c.
Copper, casting	12.75c.
Zinc, slab	6.75c. to 7.00c.
Lead, American pig	6.00c. to 6.25c.
Lead, bar	8.75c.
Antimony, Asiatic	14.00c.
Babbitt metal, medium grade	17.50c.
Babbitt metal, high grade	38.00c.
Solder, ½ and ½	22.25c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	9.50c.	10.50c.
Copper, hvy. and wire	9.25c.	10.25c.
Copper, light and bottoms	8.00c.	9.00c.
Brass, heavy	5.50c.	6.50c.
Brass, light	4.50c.	5.75c.
Hvy. machine composition	8.00c.	9.00c.
No. 1 yel. brass turnings	5.50c.	6.50c.
No. 1 red brass or compos. turnings	7.25c.	8.25c.
Lead, heavy	3.75c.	4.25c.
Lead, tea	2.50c.	3.25c.
Zinc	2.00c.	2.50c.
Sheet aluminum	7.50c.	9.50c.
Cast aluminum	7.00c.	9.00c.

brass, 6c.; lead pipe, 3.75c.; zinc, 1.75c.; pewter, No. 1, 17.50c.; tin-foil, 17.50c.; block tin, 22.50c.; aluminum, 7.50c.; all being dealers' prices for less-than-carload lots.

Reinforcing Steel

Awards Total 4000 Tons—New Projects Unusually Light

WITH 1000 tons for a warehouse in New York and other tonnages of moderate size, awards of reinforcing steel reported for the past week amounted to 4000 tons. New projects, at 1000 tons, consisted of jobs ranging from 100 to 300 tons. Awards follow:

NEW YORK, 350 tons, boiler house and Nurses' Home for New York Hospital, Seventieth Street and York Avenue, to Carroll-McCreary Co.

NEW YORK, 1000 tons, warehouse for Sears, Roebuck & Co., Ninth Avenue and Thirty-first Street, to Jones & Laughlin Steel Corporation.

NEW YORK, 125 tons, Psychopathic Hospital, First Avenue and Twenty-ninth Street, to Kalman Steel Co.

CHICAGO, 650 tons, Lane Technical High School, to Inland Steel Co.

MILWAUKEE, 600 tons, grain elevator for Milwaukee Road, to American System of Reinforcing.

SACRAMENTO, CAL., 315 tons, highw y work in San Diego County, to an unnamed bidder.

SACRAMENTO, 170 tons, overhead crossing in Tehama County, to an unnamed bidder.

LOS ANGELES, 200 tons, bank building, Hollywood Boulevard and Vine Street, to an unnamed bidder.

SAN PEDRO, CAL., 100 tons, theater, 488 West Sixth Street, to Blue Diamond Co.

PASADENA, CAL., 200 tons, dormitories for Pasadena Institute of Technology, to Soule Steel Co.

SEATTLE, 104 tons, Lincoln High School, to Pacific Coast Steel Corporation.

OLYMPIA, WASH., 130 tons, bridge at Prosser, Wash., to Pacific Coast Steel Corporation.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

RIVERDALE, ILL., tonnage not stated, grain elevator.

ST. LOUIS, 268 tons, three viaducts in Forest Park for St. Louis Board of Public Service.

LOS ANGELES, 150 tons, apartment building, Ninth Street and Kingsley Drive; bids being taken.

LOS ANGELES, 100 tons, apartment building, San Marino and Serrano Avenues; bids being taken.

LOS ANGELES, 300 tons, store at 610 South Hill Street; bids being taken.

LOS ANGELES, 100 tons, apartment building, Dunsmuir Avenue near Wilshire Boulevard; bids being taken.

LOS ANGELES, 100 tons, power station, 2904 West Eleventh Street; bids being taken.

Fabricated Structural Steel

Awards of 16,000 Tons and New Projects Totaling 15,000 Tons Make Week Light

THE past week was one of the smallest of the year in structural steel business, with awards of less than 16,000 tons, the smallest since early in January, and new projects of less than 15,000 tons, smallest since the first week in February. The only awards of size were 4200 tons for a municipal stadium in Cleveland and 2500 tons for a building in Chicago for the World's Fair. Most of the new tonnage was in New York, including 4000 tons for a telephone building addition, 3400 tons for an office building at John and Pearl Streets and 2000 tons for an addition to the Equitable Building.

The Structural Steel Board of Trade, New York, reports a total tonnage of structural steel placed in the New York district in June of 49,833 tons, compared with 58,431 tons in May, which was the largest month of the year.

North Atlantic States

WATERBURY, CONN., 500 tons, Brown Building, to Palmer Steel Co.

ELLSWORTH, ME., 100 tons, County Court House, to Palmer Steel Co.

NEW YORK, 1500 tons, apartment hotel at Ninety-seventh Street and West End Avenue, to Easton Structural Steel Co.

NEW YORK, 425 tons, mercantile building, 155 to 163 West Twenty-ninth Street, to Easton Structural Steel Co.

NEW YORK, 200 tons, Kips Bay Boys' Club, to Dreier Iron Works.

NEW YORK, 150 tons, elevated structure for Interborough Rapid Transit Co., to American Bridge Co.

STATE OF NEW JERSEY, 125 tons, highway bridge, to Bethlehem Steel Co.

PHILADELPHIA, 455 tons, building for St. Agnes' Hospital, Broad and Mifflin Streets, to American Steel Engineering Co.

BALTIMORE & OHIO RAILROAD, 400 tons, freight building in Baltimore, to American Bridge Co.

PITTSBURGH, 500 tons, section of car float for Southern Pacific Railroad, to American Bridge Co.

NICKEL PLATE RAILROAD, 700 tons, bridges at Angola, N. Y., to American Bridge Co.

PITTSBURGH & WEST VIRGINIA RAILWAY, 500 tons, four bridges, to McClintic-Marshall Co.

Central States

STEUBENVILLE, OHIO, 300 tons, Masonic Temple, to Jones & Laughlin Steel Corporation.

CLEVELAND, 4200 tons, municipal stadium, to American Bridge Co.

CEDAR RAPIDS, IOWA, 300 tons, Northwest Bell Telephone Co., to Worden-Allen Co.

CLEVELAND, 175 tons, addition to Cleveland Heights high school, to Kilroy Structural Steel Co.

CHICAGO, 2500 tons, World's Fair travel and transportation building, to an unnamed fabricator.

CHICAGO, 1192 tons, Chicago Yacht Club, to an unnamed fabricator.

CHICAGO & WESTERN INDIANA RAILROAD, 600 tons, mail building at Chicago, to McClintic-Marshall Co.

Western States

SALINA, KAN., 150 tons, theater, to St. Joseph Structural Steel Co.

OREGON CITY, ORE., 149 tons, bridge over Clackamas River, to Virginia Bridge & Iron Co.

TACOMA, WASH., 225 tons, logging skid for Weyerhaeuser Timber Co., to Lidgerwood Pacific Co.

LONG BEACH, CAL., 225 tons, transit shed, to Pacific Iron & Steel Co.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

STATE OF CONNECTICUT, 300 tons, three bridges.

BOSTON, 212 tons, medical library.

NEW YORK, 400 tons, garage at 304 East Sixty-fourth Street for Corcoran Fitzgerald Co.

NEW YORK, 4000 tons, addition to Walker Street telephone building.

NEW YORK, 3400 tons, office building at Pearl and John Streets.

NEW YORK, 2000 tons, addition to Equitable building on Seventh Avenue.

NEW YORK, 300 tons, executive building, prison and garage for Sixteenth police precinct.

BROOKLYN, 300 tons, Nurses' Home and isolation pavilion on Kingston Avenue.

NEW ROCHELLE, N. Y., 150 tons, Jefferson School.

BOUND BROOK, N. J., 500 tons, manufacturing building for Bakelite Corporation.

NEWARK, N. J., unstated tonnage, telephone building; Voorhees, Gmelin & Walker, New York, architects.

EAST VIEW, N. Y., unstated tonnage, Westchester County jail and garage.

PHILADELPHIA, 600 tons, two bridges on B Street for city of Philadelphia and Pennsylvania Railroad; M. & J. B. McHugh, Philadelphia, low bidder for general contract.

STATE OF PENNSYLVANIA, 400 tons, highway bridges.

The South

RICHMOND, VA., 500 tons, Post Office and Court House.

Central States

BALTIMORE & OHIO RAILROAD, 200 tons, bridge in Chicago.

BAGNELLE, MO., 1500 tons, lock gates for Union Electric Light & Power Co.

WAUPACA, WIS., tonnage not stated, truss span for State highway commission; Chicago Construction Co., low bidder.

Western States

SEATTLE, 114 tons, four towers for a crossing over Duwamish Waterway at West Michigan Street; general contract to General Construction Co.

TACOMA, WASH., 200 tons, steam power plant; bids opened.

SACRAMENTO, CAL., 137 tons sheet steel piling; bids July 8 by United States Engineer's Office.

German High-Pressure Locomotive

Boiler Scale Banished—Water (Steam) Is Largely Recirculated in Continuous Flow

AN exceptional steam pressure, reaching from 1420 to 1700 lb. to the square inch, is being used in a German locomotive of which an illustrated description is given in *Engineer*, London. The locomotive operates on what is known as the Loeffler principle.

This consists in evaporating water to steam in a non-fired water and steam drum by means of highly superheated steam introduced into the water in a finely divided form. The system is said to be particularly advantageous at high pressures and to overcome completely the difficulty of boiler scale. Fire is utilized only to supply heat to a high-pressure superheater, the surfaces of which are not affected by boiler scale.

The locomotive is a standard-gage unit, weighing in running order 114.8 metric tons, of which 60 tons rests upon the three pairs of driving wheels. There are three cylinders, the two high-pressure units (8.66-in. diameter) being in the conventional position, with the low-pressure cylinder (23.62-in. diameter) centrally located.

The fire box consists of a system of small tubes connected with horizontal headers at each side. A second nest of tubes connected with those forming the fire box is arranged in front, and through these the very high-pressure steam is circulated by a pump. Steam thus in circulation is raised to a temperature of 450 deg. C. (750 deg. Fahr.).

Part of this steam flows to the two high-pressure cylinders. About 77 per cent of the total steam, however, is led to a high-pressure steam evaporator—a drum partly filled with water and working at the same pressure as the high-pressure superheater. This high-pressure steam enters the evaporator through the submerged pipe having fine perforations which permit the steam to escape through the water, which it evaporates through giving up its superheat. The circulating pump draws saturated steam from the steam space of this drum and carries it back to the fire box to be resuperheated. Thus the cycle is a continuous flow.

Steam exhausted from the two high-pressure locomotive cylinders, at a pressure of about 250 lb. to the square inch, passes through an oil separator on its way to a heat exchanger. The latter is a low-pressure boiler operating at about 210 lb. to the square inch. It resembles an ordinary locomotive boiler except that the tubes, instead of being directly fired, are traversed by the hot exhaust steam from the high-pressure cylinders. This steam is thus condensed and the condensate is returned to the high-pressure steam evaporator by a high-pressure feed pump and through the high-pressure feed heater.

Steam generated in the heat exchanger or low-pressure boiler is superheated to about 300 deg. C. (575 deg. Fahr.) in the low-pressure superheater, spaced between the high-pressure superheater and the feed heater. This steam is then fed to the low-pressure cylinder, which is centrally located between the wheels of the locomotive, and finally is exhausted to the blast pipe in the ordinary way.

Two Refractories Companies Join North American

The North American Refractories Co., which was formed March 1, 1929, by a consolidation of the Ashland Fire Brick Co., Ashland, Ky.; Crescent Refractories Co., Curwensville, Pa.; Dover Fire Brick Co., Strasburg, Ohio; Elk Fire Brick Co., St. Marys, Pa.; Farber Fire Brick Co., Farber, Mo., and the Queens Run Refractories, Inc., Lock Haven, Pa., has purchased the United States Refractories Corporation, Mount Union, Pa., and the Savage Mountain Fire Brick Co. of Allegany County, Frostburg, Md.

These acquisitions give the North American Refractories Co. an actual capacity of 200,000,000 9-in. equivalent refractories. J. D. Ramsay is president of the North American Refractories Co., whose headquarters is in the National City Bank Building, Cleveland.

Fewer Cars Needed for This Year's Shipments

WASHINGTON, July 5.—Shipments of iron and steel products during July, August and September will require 508,216 cars, or 11.9 per cent less than the 577,102 cars used in the corresponding quarter of 1929, according to estimates of the Shippers' Regional Advisory Boards. Machinery and boilers will require 51,460 cars, a decrease of 14.3 per cent from the 60,039 cars in the third quarter of last year.

Requirements of ore and concentrates are estimated at 821,534 cars, a decline of 16 per cent from the 977,753 cars employed during the like quarter of last year. Coal and coke requirements are estimated at 2,280,511 cars, a drop of 5.4 per cent from the 2,410,372 cars required in the third quarter of 1929.

The boards anticipate that carload shipments of the 29 principal commodities dealt with will be approximately 8,806,716 cars, a reduction of 613,603 or 6.5 per cent from the corresponding period of 1929. The reports of the boards, made public by the American Railway Association, said that, owing to the general business situation and the uncertainty as to the outlook that exists in various industries, a forecast at this time is somewhat difficult to make.

Lathe Spindle Nose Standard Still Under Consideration

In response to many inquiries regarding the standardization of spindle noses for engine lathes, turret lathes and other machines with rotary spindles, the National Machine Tool Builders' Association has issued technical bulletin No. 109 setting forth the status of this project.

The bulletin points out that the proposal submitted by the Jones & Lamson Machine Co., Springfield, Vt., appealed to some builders of turret and engine lathes as being somewhat better than the type they had been using and has been adopted by them individually. The various groups concerned with this project, however, have not as yet indorsed officially any particular type of spindle nose.

Other proposals are now under consideration; one of them seems to have additional advantages for work requiring quick changing of the chuck.

It is stated in the bulletin that the establishing of a national standard is not desirable until it is well demonstrated that the construction adopted will meet all the requirements of the user in giving a firm attachment of the tool-holding or work-holding elements and also enable the user to change these elements quickly.

A special committee on gradings and complaints of the St. Louis Chapter of the Institute of Scrap Iron and Steel will cooperate with mills in the St. Louis district, by investigating complaints on shipments of scrap. The committee consists of D. H. Cohen, chairman; Jack R. Forcheimer, Fred S. Fuld and William Rosenthal, all of St. Louis. The committee was appointed as a result of a request by a St. Louis consumer of scrap, for the cooperation of the institute.

Coke and Coal Output Lower in June

	June, 1930	May, 1930	June, 1929
Beehive coke made, net tons	267,000	241,100	602,400
do., six months	1,701,700	.....	3,120,300
Bituminous coal mined	33,683,000	35,954,000	35,580,000
do., six months	230,603,000	.....	256,576,000
Anthracite mined	5,202,000	5,947,000	5,069,000
do., six months	33,811,000	.....	36,869,000

From United States Bureau of Mines.

British "Empire Trade" Movement Gaining

Banks Support Move to Combat Adverse Tariffs—Heavy Rolling Stock Recommended for Soviet Union Railroads

(*By Cable*)

LONDON, ENGLAND, July 7.

PRESSURE on the Government for safeguarding of steel has increased since publication of the recent report by a commission, which visited the Continent.

Representatives of the iron and steel industry are understood to be discussing a program to include more than a regional reorganization recommended by the commission. It is being urged that the entire British steel demand be filled by British mills running full time, so that reduced overhead charges would avoid increasing selling prices. Shipbuilders are expected to continue hostile to safeguarding, but may be won over.

The Sheffield Chamber of Commerce is arranging to send an industrial mission to South America, headed by A. K. Wilson, governing director of Spear & Jackson, Ltd., Sheffield. It is hoped that substantial orders for British products will result.

British Banks Supporting "Empire Trade" Movement to Combat Hostile Tariffs.

* * *

Ralph Budd of Great Northern Railway Advises Soviet Union to Buy Heavy Rolling Stock and Automatic Equipment.

* * *

Italian Government May Import Steel Scrap for Country's Annual Requirements of 1,000,000 Tons.

* * *

Export Subsidiaries of Continental Steel Mills Oppose Cartel Plan to Control Export Prices.

Banks Advocate "Empire Trade"

Leading banks are acting in a personal capacity in supporting the "Empire Trade" movement, which they assert is the only way of combating tariff hostilities everywhere manifest, preserving British colonial markets for British goods and narrowing the British domestic market for goods made in hostile tariff countries. A general tariff is advocated against imports, except from British colonies. That British colonies will ever admit British goods free is unthinkable, but this obvious fact appears to be ignored in the pursuit of political ambitions.

A public utility holding corporation in the United States is said to have acquired a 50 per cent interest in the Vereinigte Elektrizitaetswerke Westfalen in Germany.

American Type Railroads for Russia

Ralph Budd, president, Great Northern Railway, who is advising the Soviet Union on reorganization of its railroads, has recommended more powerful locomotives, larger trucks and automatic brakes, couplings and signaling.

Debenture bond holders are taking over control of the Barrow Hematite Steel Co., which has been compelled to reorganize by writing down its fixed assets by nearly £1,500,000 ($7,290,000). The Ebbw Vale Steel, Iron & Coal Co. annual report shows a loss of more than £500,000 ($2,430,000), increasing its adverse balance to more than £1,500,000 ($7,290,000).

Rationalization plans are being less favorably regarded in view of the serious losses by the Royal Mail Steamship Co., the cables and wireless difficulties and now a serious decline in the stock of Imperial Industries. Interviewed by a deputation from the stock exchange, officials of Imperial Industries stated that they were "astonished at the way the company's business has been maintained" and added that "advices from China are the best this year." Nothing was said about other markets. In some quarters it is suggested that rationalization may create a dangerously unbalanced situation.

Foreign Tank Ships Awarded

Norwegian owners have placed orders for two all-British steel tankship whalers of 21,500 tons each with the Furness Shipbuilding Co., Haverton Hill-on-Tees. The Standard Oil Fuel Co., New York, has placed an order for a 14,000-ton oil tankship with Scotts Shipbuilding & Engineering Co., Greenock.

A West Hartlepool syndicate has bought the Middleton shipyard and equipment of Irvine's Shipyard & Dry Dock Co., West Hartlepool. As a result of rationalization, Ruston & Hornsby, Ltd., is closing its Stock-

---

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export.	£11	10s.					$55.95	
Billets, open-hearth	£6	0	to	£6	10s.		29.20 to	$31.63
Black sheets, Japanese specifications	12	5					59.61	
Tin plate, per base box	£0	18	to	£0	18¼		4.37 to	4.43
							Cents a Lb.	
Steel bars, open-hearth	£8	0	to	£8	10		1.74 to	1.85
Beams, open-hearth	£7	7½	to	£7	17½		1.60 to	1.71
Channels, open-hearth	£7	12½	to	£8	12½		1.66 to	1.87
Angles, open-hearth	£7	7½	to	£7	17½		1.60 to	1.71
Black sheets, No. 24 gage	£9	15	to	£10	0		2.12 to	2.17
Galvanized sheets, No. 24 gage	£11	17½					2.57	

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£3	2½s.	to	£3	3½s.		$15.21 to	$15.45
Billets, Thomas	£4	13	to	£4	14		22.63 to	22.87
Wire rods, low C., No. 5 B.W.G.	£6	2	to	£6	4		29.69 to	30.19
Rails, light	£6	0					29.20	
Black sheets, No. 31 gage, Japanese	£11	5	to	£12	12		54.68 to	58.32
							Cents a Lb.	
Steel bars, merchant	£5	7½					1.18	
Steel bars, deformed	£5	6½	to	£5	7½		1.17 to	1.18
Beams, Thomas, British standard	£5	1	to	£5	2½		1.11 to	1.14
Channels, Thomas, American sections	£5	12	to	£5	14		1.24 to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	£5	6					1.17	
Angles, Thomas, 3-in.	£5	7½					1.18	
Hoop and strip steel over 6-in. base	£5	15					1.27	
Wire, plain, No. 8 gage	£6	12½					1.43	
Wire, barbed, 4-pt. No. 12 B.W.G.	£10	12½					2.30	
Wire nails, base	£6	7½					$1.42 a keg	

port works and transferring manufacture to the Lincoln and Grantham plants.

Steel Trade Still Depressed

The iron and steel depression continues, and little improvement is yet in sight. Further hematite furnaces are blowing out, so that the total active North East coast furnaces producing all kinds of iron will be only 29 at this week end.

Hematite makers are accumulating stocks, which are now about 100,000 tons. The Cleveland producers are maintaining prices and domestic consumers are filling only immediate needs.

Steel demand is dull and heavy mills are operating only part time. Domestic shipbuilding demand will improve as steel orders are released for new liners, but export demand is meager and the outlook is unfavorable.

Continental iron and steel trade here is quiet, but Continental mills report slightly increased interest from India, China and Brazil. The Western European Entente has reduced foundry pig iron prices, bringing the quotation for the United Kingdom to £3 3s. ($15.31) per ton, f.o.b., but the actual market quotation is as low as £3 ($14.58) per ton.

The Continental Steel Cartel is planning to establish an international sales office for semi-finished material and shapes by Aug. 1, and has recommended that two mills in the cartel from each country be temporarily responsible for sales, suggesting the Ougree-Marihaye works and Athus Grivegnee works to represent Belgium.

Finished steel is quiet, with reports still current of sellers naming less than the official cartel quotations.

Tin plate is quiet, with mills which are conference members accepting 18s. ($4.37) per base box, f.o.b. works port, while outside works are reported to have accepted less. Export inquiry is moderate, suggesting that business will develop when buyers consider prices are stable. At present the uncertain tin market is a deterrent. Galvanized sheets are being sold in small scattered lots and prices are unchanged. Black sheets are dull in the heavy gages, with but little demand from the Far East.

German Reparations Sales Reach New Record

HAMBURG, GERMANY, June 23.—Deliveries by Germany of iron and steel products on reparations account reached another record in May. The value of ships exported for reparations payments was 26,700,000 m. ($6,354,600), of iron and steel products 9,800,000 m. ($2,332,400), vehicles 6,800,000 m. ($1,618,400), electrical machinery 4,000,000 m. ($952,000) and all other machinery 13,800,000 m. ($3,284,400).

Italy Considers Scrap Import Monopoly

ROME, ITALY, June 21.—The Government is considering establishing a single company to import iron and steel scrap for the steel industry, supplanting the four existing companies, one of which buys scrap for southern Italy, one for the central and two for the northern districts. In 1929, Italy imported close to 1,000,000 tons of scrap, of which France furnished almost half and a substantial tonnage was received from the United States.

Aluminum Duty Applied by Germany

HAMBURG, GERMANY, June 23.—Preparations are being made to apply the much discussed duty on aluminum on July 15, despite protests by the Federation of Non-Ferrous Metal Merchants. Import restrictions on aluminum will be abolished, and the cartel has agreed to maintain its prices at the world market level.

Twelve Bid for South African Steel Plant

LONDON, ENGLAND, June 25.—Twelve companies have submitted bids for construction of the blast furnaces, open-hearth furnaces and rolling mills included in the first unit of the South African Steel Corporation at Pretoria. Bidders include British and German engineering companies, but no American interests. American companies were indirectly represented, however, as certain German bidders are licensed to build under American patents. Bids will be taken shortly for the coke ovens, and meanwhile work on the site of the new plant at Pretoria is proceeding.

Foreign Railroads Buy Diesel Locomotives

HAMBURG, GERMANY, June 23.—Foreign railroads are showing active interest in the purchase of Diesel locomotives instead of steam. Inquiries have recently been received by German builders from China, the Burma State Railways in India and from Central and South American countries. The recent order of the Siamese State Railways, which in the past have bought steam locomotives, was entirely for Diesel units, six of 450 hp. going to Sulzer Brothers, a German-Swiss company, and six of 900 hp. to Frichs A. G., Aarhus, Denmark.

Steel Cartel Is Opposed by Exporters

DUSSELDORF, GERMANY, June 21.—The Continental Steel Cartel has reached agreements with steel merchants and exporters in Great Britain, Switzerland and Holland, but has been unable to conclude similar contracts in Germany. Obstacles to a settlement with German merchants and exporters are the exporting subsidiaries of the large steel producers, such as the Stahlunion G.m.b.H., export organization of the Vereinigte Stahlwerke A. G. These subsidiaries sell steel for export at the same prices as steel merchants and small exporters and claim that a 1s. or 2s. per ton profit, which is the extent of the protection the cartel will give, is insufficient for them to continue in business.

Another problem in reaching an agreement with German exporters is the fact that a considerable volume of German steel is sold for export by French, Czechoslovakian, Polish and other foreign exporters. German exporters, who furnish this steel are unwilling to abandon such a profitable business, which would be necessary if the cartel limited their profits to 1s. or 2s. per ton.

Another American Railroad Car System for Europe

General American Tank Car Co. has completed arrangements for the organization of a third tank and refrigerator car system in Europe. The new company, the International Refrigerating Car Line, is another step in the American company's program for operations abroad.

Wagner Electric Corporation, St. Louis, has combined its sales office and service station for the Atlanta territory in a new fireproof building at 14-20 Alexander Street, N. W., Atlanta.

Fabricated Steel Plate Orders

(Net Tons)

	May, 1930	April, 1930	May, 1929
Total orders	28,678	37,709	47,715
Per cent of capacity	36.1	46.6	59.7
Total, five months	182,846(a)	.....	238,895
Subdivision of orders:			
Oil storage tanks	9,222(b)	7,509	10,087
Refinery materials and equipment	3,787(c)	3,869	4,053
Tank cars	1,329(d)	2,648	912
Gas holders	2,314	6,489	5,300
Blast furnaces	426	273	1,245
Stacks and miscellaneous	11,600(e)	16,921	26,118

From United States Department of Commerce.
(a) Smallest since 1925.
(b) Largest since last September.
(c) Smallest since last February.
(d) Smallest since last August.
(e) Smallest since January, 1929.

Machinery Markets and News of the Works

Holidays Add to Quietness

With Automotive and Other Plants Closing for Two Weeks, Little Improvement Is Looked for in July

SHORTENED by a double holiday, the past week was unusually devoid of orders and inquiries for machine tools. Inquiry on hand, however, is of fair volume, but the placing of orders against it still is largely deferred.

Buying by the motor car industry is almost at a standstill, and the closing of automotive and other metalworking shops for two weeks or longer for vacations or inventories points to quiet machine tool trade conditions during the remainder of July. On the other hand the opportunity afforded by such shut-downs for making miscellaneous replacements without interfering with production will no doubt be taken advantage of in numbers of cases. Little interest is being shown by the railroads.

Bolstered by purchases for a refrigerator plant, the June business of some Chicago dealers totaled higher than that for May. Sales in the Chicago district over the past six months, however, were only from 55 to 65 per cent of those of the first half of 1929, a boom year.

Used tools that are in good condition and are attractively priced seem to be actively sought; 12 such pieces of shop equipment were taken by a chemical company in Everett, Mass.

New York

NEW YORK, July 8.—Influenced somewhat perhaps by the double holiday, the past week in machine tool trade was absolutely flat. Most sellers in this district did little or no business. Inquiries were as scarce as orders. Some reports are being received from large manufacturing companies of gains in sales of their products during the past few weeks, but such favorable signs are exceedingly spotty and are matched by many more reports of seasonal declines.

The Amtorg Trading Corporation, New York, official buyer of machine tools for the Soviet Government, is making exacting demands for concessions in the way of credit terms from American machine tool builders, and quite a number of companies have passed up prospective business rather than accede to these terms. It is stated here that a good many machine tool orders which might have come to this country, were American tool builders willing to sell at Amtorg's own terms, are being placed in England and Germany.

General Electric Co., Schenectady, N. Y., through General Electric Realty Co., 120 Broadway, New York, a subsidiary, will soon take bids on general contract for a factory branch and distributing plant at Minneapolis, Minn., consisting of four-story and basement unit, 80 x 160 ft., and two-story and basement structure adjoining, 80 x 160 ft., to cost about $450,000 with equipment.

Murray Klein, 65 Court Street, Brooklyn, architect, has plans for a one-story automobile service, repair and garage building, to cost about $100,000 with equipment.

American Machine & Metals, Inc., New York, recently formed, has taken over plants and business of Manhattan Electrical Supply Co., 15 Park Place, New York, and latter name will be discontinued. United States Manganese Corporation and Trout Mining Co., as well as Troy Laundry Machinery Co., Troy, N. Y., heretofore held by Manhattan company, will be operated as subsidiaries. General expansion is planned. C. K. Woodbridge, formerly president of Kelvinator Corporation, Detroit, and Dictaphone Co., Bridgeport, Conn., will be president of new company.

Cities Service Co., 60 Wall Street, New York, operating oil, natural gas, electric and other utility properties, is arranging for expansion in southern California, particularly in natural gas supply and pipe line distribution, to cost over $2,000,000. A going company is being acquired and will represent main operating unit. Company also plans other extensions in utilities, to cost more than $25,000,000.

Federal Plumbing Supply Co., 1719 St. Marks Avenue, Brooklyn, has plans for a three-story plant, including storage and distributing unit, with pipe cutting and fitting division, etc., 50 x 115 ft., to cost over $65,000 with equipment. Edward M Adelsohn, 26 Court Street, is architect.

Board of Education, Tuxedo Park, N. Y., is considering installation of manual training equipment in new three-story and basement high school to cost over $225,000. Guilbert & Betelle, 20 Branford Place, Newark, N. J., are architects.

Jacob R. Lefferts, Matawan, N. J., is at head of a project to establish and operate an airport at Lake Lefferts, between Matawan and South Amboy, and will build hangars with repair and reconditioning facilities, and other field units.

Bakelite Corporation, 247 Park Avenue, New York, manufacturer of rubberized insulation products, has asked bids on general contract for new plant at Bound Brook, N. J., consisting of three main manufacturing units, one, two, and three stories, 406 x 410 ft., one and two stories, 128 x 223 ft., and one and two stories, 100 x 200 ft., with one-story machine shop, 100 x 100 ft., and wing extension, 35 x 106 ft., for automobile service and repairs, and one-story power house, 50 x 100 ft. Other units, including pumping station, switch house, scale house, etc., will be built, entire project to cost over $1,000,000 with machinery. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers.

Driver-Harris Co., Harrison, N. J., manufacturer of metal alloys, resistance wires, etc., is considering call for bids for one and two-story addition, to cost over $200,000 with equipment. J. A. Finegan, 776 Broad Street, Newark, is architect and engineer.

Board of Freeholders, New Brunswick, N. J., has arranged for a bond issue of $12,000 for purchase of property at South River as site for a new county vocational school, for which plans will be prepared soon, structure to cost over $250,000 with equipment. Board of Education of County Vocational Schools, New Brunswick, will be in charge.

National Oil Products Co., Essex Street and Passaic River, Harrison, N. J., has broken ground for four-story and basement addition, 60 x 85 ft., making eleventh unit in group at that location, to cost over $175,000 with machinery. General contract has been let to Fred Kilgus, Inc., 13 South Sixth Street, Newark. Bishop & Scudder, 9 Clinton Street, Newark, are architects and engineers.

Dosch-King Co., 30 Clinton Street, Newark, road materials, road oils, etc., has purchased two acres on Troy Hill Road, Morris Township, near Morristown, N. J., for new storage and distributing plant to cost over $50,000 with equipment.

Millard A. McCoy, 611 Mortimer Street, Utica, N. Y., and Clarence E. McCoy, Natural Bridge, N. Y., have organized McCoy Iron Works, with capital of $60,000, to operate a structural steel and general iron works at Utica.

Buffalo

BUFFALO, July 7.—J. H. Williams & Co., 400 Vulcan Street, Buffalo, manufacturers of drop forgings, machine equipment, etc., is asking bids on general contract for a one-story addition, totaling about 30,000 sq. ft. floor space, to cost over $70,000 with equipment.

Board of Education, Genesee Building, Buffalo, will receive bids until July 31 for tools and equipment for new Burgard vocational high school, including machinery for automotive, aircraft and printing industries. Francis H. Wing is deputy superintendent in charge of vocational education.

Mount Morris Iron & Metal Co., Inc., Mount Morris, N. Y., care of James O. Moore, Liberty Bank Building, Buffalo, attorney, representative, recently organized, plans operation of local mill for manufacture of iron products and line of metal goods.

In connection with plans to concentrate aircraft engine production at plant of Wright Aeronautical Corporation, Paterson, N. J., an affiliated organization, Curtiss Airplane & Motor Co., Vulcan and Kenmore Avenues, Buffalo, is arranging for early remodeling of local works to manufacture aircraft for military and commercial service, including complete parts production and assembling. Company has recently received order from Government for 400 Wright aircraft engines of Cyclone type, to cost $2,176,662.

Solvay Process Co., Solvay, Syracuse, N. Y., will carry out expansion at plant to double present capacity of soda ash, bicarbonate of soda and other alkali products, including new buildings and equipment, to cost about $5,000,000. Work will include construction of a pipe line from Tully Valley to Solvay, for brine. Company is a subsidiary of Allied Chemical & Dye Corporation, 61 Broadway, New York, which will carry out other expansion at different plants.

New England

BOSTON, July 7.—With machine tool dealers closed the past week from Thursday until Monday, no sales of importance were reported, and correspondence with prospects was limited to a few small items. A feature of the used tool market was the purchase of about a dozen pieces of machine shop equipment by the Merrimac Chemical Co., Everett, Mass., and a Hendey shaper in excellent condition by a Greater Boston shop.

Sales of small tools have fallen off. Many New England metal-working shops observed the week-end holiday or are closed for inventory or for vacations.

Berst Forster Co., Duxfield, Me., has plans for a match manufacturing plant at Peru, Me., three stories, 200 x 300 ft., to contain a small machine shop.

City of Westfield, Mass., will take bids about July 15 on a two-story trade school addition, to cost $85,000 without equipment.

Carpenter Mfg. Co., Norwich, Conn., has purchased Schwartzenbach-Huber Co. silk manufacturing plant and will equip to manufacture hardware specialties.

Niles Machine Co., Lebanon, N. H., manufacturer of machinery and parts, has purchased factory of Lamson Co., Lowell, Mass., and will remodel for early occupancy.

National Folding Box Co., James Street, New Haven, Conn., manufacturer of folding paper boxes and cartons, has awarded general contract to E. & F. Construction Co., 94 Wells Street, Bridgeport, Conn., for four-story and basement addition, 83 x 178 ft., to cost about $175,000 with machinery. Fletcher-Thompson, Inc., 542 Fairfield Avenue, Bridgeport, Conn., is architect and engineer.

Union Twist Drill Co., Athol, Mass., has taken out a permit for a two-story addition, to cost about $45,000 with equipment.

School Board, Meriden, Conn., has awarded general contract to M. A. Michaels, Buckingham Street, for new trade and vocational school, to cost over $170,000 with equipment.

Simonds Saw & Steel Co., Fitchburg, Mass., is considering consolidation of production at one location, and is selecting site following discontinuance of negotiations with Boston & Maine Railroad for acquisition of shop properties at East Fitchburg. Steel producing unit will be maintained at Lockport, N. Y., as heretofore, where company recently began an expansion program to cost over $250,000 with equipment.

Stanley Body Works, Inc., Bridgeport, Conn., manufacturer of automobile bodies, has changed its name to Blue Ribbon Body Works, Inc.

Universal Winding Co., Auburn, R. I., manufacturer of textile machinery and parts, will soon take bids for a three-story addition, 60 x 160 ft., to cost about $85,000 with equipment. Headquarters are at 95 South Street, Boston. Company architect is in charge.

Hotchkiss Brothers Co., Water Street, Torrington, Conn., manufacturer of cabinets, etc., has awarded general contract to Torrington Building Co., Torrington, for a top addition, 40 x 145 ft., to present two-story factory, to cost over $40,000 with equipment.

Philadelphia

PHILADELPHIA, July 7.—Sharp & Dohme, Inc., Broad and Wallace Streets, Philadelphia, will soon begin erection of a five-story addition to chemical plant, totaling about 100,000 sq. ft. floor space, for processing and general manufacture, to cost over $200,000 with machinery. A new power plant will also be built to cost about $50,000. Company is occupying plant of H. K. Mulford Co., recently acquired. Executive offices have been removed to this location from Baltimore.

Brown Instrument Co., Wayne and Roberts Avenues, Philadelphia, manufacturer of pyrometers and other electrical measuring instruments, has filed plans for two additional stories to present factory, to cost about $80,000 with equipment. Ballinger Co., Twelfth and Chestnut Streets, is architect and engineer.

Great Atlantic & Pacific Tea Co., 420 Lexington Avenue, New York, will install conveying, elevating and other mechanical-handling equipment in new storage and distributing plant at Philadelphia, 100 x 300 ft., to be occupied under lease, to cost $200,000. Structure will be built by Suburban Realty & Construction Co., Wayne Avenue and Sedgwick Street, Philadelphia.

American Stove Co., 825 Chouteau Avenue, St. Louis, manufacturer of stoves, ranges, ovens, etc., will establish factory branch, storage and distributing plant at 401 North Broad Street, Philadelphia, where about 25,000 sq. ft. of floor space has been leased. W. E. Kirby is manager of local division.

Stanton Forging Co., Pershing Street and Whitman Avenue, Camden, N. J., manfacturer of drop forgings, gear wheels, etc., plans rebuilding part of one-story plant, 50 x 150 ft., destroyed by fire July 2.

Sun Oil Co., 1608 Walnut Street, Philadelphia, is planning to rebuild part of plant at Marcus Hook, Pa., recently destroyed by fire, with loss of about $50,000, including storage and distributing equipment. Susquehanna Pipe Line Co., a subsidiary, has awarded contract to Macpherson Construction Co., Dallas, Tex., for construction of pipe line, with pumping and power stations, etc., from refinery at Marcus Hook to Cleveland, by way of Harrisburg, Pa., and Pittsburgh, about 500 miles, to cost over $20,000,000.

Covington A. Miller, York, Pa., and associates have organized Miller Metal Products Co., with capital of $50,000, and will operate local plant for manufacture of line of metal goods as well as machine parts and mechanical equipment. Russell E. Miller and C. Ralph Brandt, both of York, are interested in new organization.

Gulf Refining Co., Frick Annex, Pittsburgh, has acquired one and a half acres at Wilmington, Del., as site for new storage and distributing plant to cost about $50,000, on which work will begin at once. Plant will have capacity of over 400,000 gal. of oil.

South Atlantic

BALTIMORE, July 7.—Officials of G. Ober & Sons Co., 110 East Lombard Street, Baltimore, manufacturer of fertilizers, have organized Oberphos Co., with capital of $600,000 and 10,000 shares of stock, no par value, as an affiliated interest, to manufacture and develop equipment and processes for production of fertilizers and superphosphates. Koppers Coke Co., Koppers Building, Pittsburgh, will be identified with new company through its subsidiary, Bartlett Hayward Corporation, 200 Scott Street, Baltimore, manufacturer of gas and coke equipment, of which Howard Bruce is chairman of board. Gustavus Ober, Jr., will be president of Oberphos Co.

du Pont Cellophane Co., River Road, Buffalo, manufacturer of transparent wrapping materials, has asked bids on several contracts for new plant at Ampthill, near Richmond, Va., to cost over $1,500,000 with machinery. Company is a subsidiary of E. I. du Pont de Nemours & Co., Wilmington, Del.; du Pont Engineering Co., Wilmington, an affiliated organization, is engineer for project.

Standard Oil Co., 746 Marietta Street, N. W., Atlanta, Ga., has plans for a two-story and basement automobile service, repair and garage building for company motor trucks and cars, to cost about $120,000 with equipment. Company engineering department is in charge.

Baltimore County School Board, Towson, Md., is considering installation of manual training equipment in new local three-story and basement high school to cost $250,000, for which general contract has been let to Price Construction Co., Maryland Trust Building, Baltimore. Smith & May, Calvert Building, Baltimore, are architects.

Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until July 22 for forged steel

crankshaft for Mare Island yard, and for four geared pneumatic hoists, each of 4000-lb. capacity, for Puget Sound Navy Yard.

East Coast Utilities Co., Richmond, Va., operating electric light and power properties in Virginia, Delaware and North Carolina, is disposing of a note issue of $900,000, part of fund to be used for extensions and improvements in plants and systems. Company is operated by Empire Public Service Co., 29 South LaSalle Street, Chicago.

Glenn L. Martin Co., Baltimore, has secured orders totaling more than $4,000,000 for fabricated flying boats and other aircraft, and will develop maximum capacity at works both for parts production and assembling.

City Council, Monroe, N. C., is considering installation of a municipal electric light and power plant, in conjunction with city-owned waterworks, to cost over $75,000 with machinery.

Virginia Electric & Power Co., Richmond, Va., has asked bids on general contract for a three-story and basement equipment storage and distributing plant, with repair department, etc., 100 x 100 ft., and automobile service, repair and garage building, 80 x 250 ft., for company motor trucks and cars, to cost about $260,000 with equipment. Carneal, Johnston & Wright, Electric Building, are architects.

St. Louis

ST. LOUIS, July 7.—Ralston Purina Co., 835 South Eighth Street, St. Louis, has awarded general contract to James Hettelsater Construction Co., Kansas City, Mo., for eight-story addition to cereal mill, 65 x 128 ft., to cost about $200,000 with equipment. Company engineering department is in charge.

Whitaker Battery Supply Co., 2436 Charlotte Avenue, Kansas City, Mo., manufacturer of electric storage batteries, etc., has awarded general contract to Morris Hoffman, Victor Building, for one-story plant at North Kansas City, 160 x 190 ft., to cost about $80,000 with equipment. Robert Gornall, 300 West Forty-seventh Street, is architect. James P. Whitaker is president.

Board of Education, Scott City, Kan., is considering installation of manual training equipment in new central high school, two stories and basement, to cost about $150,000, for which plans have been drawn by Mann & Co., Rorabaugh-Wiley Building, Hutchinson, Kan., architects.

Southwestern Natural Gas Co., Tulsa, Okla., has approved plans for new high-pressure pipe line from Sapulpa to Tulsa, and from Boynton to Muskogee, Okla., with branch line to Sand Springs, Okla., and vicinity, to cost over $650,000 with compressor stations, etc.

Packard Motor Car Co., 201 West Tenth Street, Oklahoma City, Okla., has awarded general contract to J. A. Werme Steel & Iron Works, 510 North Indiana Street, for two-story service, repair and sales building, to cost $100,000 with equipment. Joseph I. Davis, Hales Building, is architect.

Valley Electric Corporation, 4221 Forest Park Boulevard, St. Louis, manufacturer of ball-bearing electric motors, has taken over building at 2121 Westwood Boulevard, Oklahoma City, Okla., and will remove to that location and increase capacity. Company has opened offices at 221 West First Street, Oklahoma City.

St. Louis County Gas Co., Webster Groves, Mo., has plans for a one-story addition to artificial gas-generating plant at Shrewsbury, Mo., to cost over $85,000 with machinery. Klipstein & Rathman, 318 North Eighth Street, St. Louis, are architects.

McCanse Airport, 449 East Monroe Street, Springfield, Mo., Harold J. Pranter, manager, is planning establishment of airport near Table Rock dam, including hangar, repair shop and other field units, to cost over $50,000 with equipment.

City Council, Guthrie, Okla., has been authorized to issue bonds for $225,000, proceeds to be used for a municipal artificial gas plant. City engineer, City Hall, in charge.

Welded Products Corporation, 1625 Cleveland Avenue, Kansas City, will expend $200,000 for a new plant, instead of $60,000, as reported in June 26 issue of THE IRON AGE.

Cleveland

CLEVELAND, July 7.—Dealers sold a few single machines the past week, mostly for maintenance work. While some additional business is in prospect, buyers are slow in placing orders. Buying by the motor car industry is almost at a standstill, although the Chevrolet Motor Co. purchased two presses from a local maker during the week. With many plants shutting down for two weeks this month, prospects are not bright for any pick-up in business in July. Contractors' equipment, including concrete mixers, pumps and hoists, is in good demand for road and building work. One Ohio manufacturer of power pumps is able to maintain capacity operations.

W. S. Tyler Co., 3613 Superior Avenue, Cleveland, manufacturer of wire cloth, screens, etc., has plans for a three-story and basement addition, 70 x 105 ft., to cost over $125,000 with equipment. George S. Rider Co., Marshall Building, is architect and engineer.

United States Gypsum Co., 300 West Adams Street, Chicago, has acquired No. 2 plant of American Welding Co., Warren, Ohio, and will remodel for its metal lath and building steel division, recently acquired from Youngstown Pressed Steel Co., Youngstown. Company will also transfer equipment at plant of Northeastern Sand & Metal Co., Jeanette, Pa., lately purchased, to new location, where production will be concentrated for this district.

Board of Education, Akron, Ohio, plans installation of manual training equipment in new multi-story high school to cost about $400,000, for which bids have been asked on general contract. M. M. Konarski, Central High School, is architect for board.

Monarch Products Co. Tiffin, Ohio, recently formed by merger of Monarch Mfg. Co. with local works, and Juvenile Products Co., Toledo, Ohio, is planning expansion and will establish department for production of metal toys and kindred specialties.

Cleveland Interurban Railway Co., Terminal Tower, Cleveland, has awarded general contract to Sam W. Emerson Co., 1836 Euclid Avenue, for one-story repair and reconditioning shop for electric cars, 60 x 140 ft., to cost about $65,000 with equipment.

Spicer Mfg. Corporation, 4100 Bennett Road, Toledo, Ohio, manufacturer of universal joints and other automotive equipment, has acquired universal joint-manufacturing branch of Superior Universal Products Corporation, Toledo, including dies, patterns, tools, etc., and will consolidate at its local plant.

Cincinnati

CINCINNATI, July 7.—Demand for machine tools the past week reflected the usual seasonal influences; fresh bookings were below those of the previous week. Inquiry, while not quite as brisk as a month ago, is fair, but buyers still fail to act upon quotations. With many plants closed for vacation periods, production generally is low. Factories that are operating, however, are on curtailed schedules.

Automatic Coal Burner Co., Memphis, Tenn., recently formed with capital of $25,000 by R. J. Billings, 2221 Washington Street, and associates, plans operation of local factory to manufacture fuel-burning equipment and appliances.

City Council, Louisville, is considering new hangar, with repair and reconditioning facilities, at municipal airport, Bowman Field, to cost about $90,000 with equipment.

Procter & Gamble Co., Gwynne Building, Cincinnati, manufacturer of soaps, acids, etc., has begun construction of new plant unit at Long Beach, Cal., to cost about $4,500,000 with machinery. Stone & Webster, Inc., 120 Broadway, New York, and Los Angeles, is engineer and contractor.

Board of Education, Louisville, plans installation of manual training equipment in new Crescent Hill junior high school, to cost close to $500,000, for which general contract will be let to Rommel Brothers, 919 East Broadway. J. Meyrick Colley, 1411 Dove Road, is architect.

Memphis Natural Gas Co., Memphis, Tenn., plans early construction of pipe line to Indianola, Moorhead and Greenwood, Miss., about 50 miles, to cost over $300,000 with compressor stations. Later a line will be extended to Winona, Grenada and Charleston, Miss., to cost close to like sum. M. B. Higman is chief engineer.

Board of Trustees, State Reformatory, Frankfort, Ky., is considering rebuilding part of chair manufacturing plant destroyed by fire July 2, with loss reported at about $85,000 including equipment. Factory was operated in conjunction with Kenney Furniture Co., Frankfort, which had investment in machinery and supplies.

Contracting Officer, Wright Field, Dayton, Ohio, is asking bids until July 16 for propeller hub assemblies; until July 21 for 130,000 ft. of lighting and power cable and 155,000 ft. of ignition cable.

Capps Casket Co., Jackson, Tenn., recently organized by D. R. Capps, Jackson, and associates, is planning early construction of one-story plant, to cost about $35,000 with equipment.

Milwaukee

MILWAUKEE, July 7.—Machine-tool business was markedly interrupted both as to orders and production by the holiday period, practically all shops being closed from Thursday night until Monday morning. June, as a whole, produced probably a smaller volume of new orders than any month since November, but the industry finds encouragement in a more regular flow of inquiry. However, intending buyers are slow to act on quotations. A fair quantity of replacement business is being closed from day to day, but otherwise the market lacks activity.

Bump Mfg. Co., LaCrosse, Wis., has been incorporated with $200,000 capital stock to manufacture a general line of air compressors and other mechanical equipment. Headquarters are being established at 1830 West Avenue, South, in plant of Bump Paper Fastener Co. George P. Bump is president of both companies. Myron D. Savage and William J. Ferris are interested in new enterprise.

Althouse-Wheeler Co., Waupun, Wis., manufacturer of windmills, pumps, etc., sustained loss of $10,000 by fire which destroyed grinding room and general metal-working department, 40 x 80 ft. Shop will be replaced by new structure.

Milwaukee Board of School Directors, 1006 Highland Avenue, will soon call for bids for four-story addition, 160 x 200 ft., to Girls' Technical High School, to cost about $500,000. Guy E. Wiley is school board architect; Frank M. Harbach is secretary and business manager of board.

Wisconsin State Board of Control, A. W. Bayley, Madison, secretary, has directed Arthur Peabody, State architect, Madison, to prepare plans for a new shop for manufacturing automobile license plates at Wisconsin State Prison, Waupun. Appropriation for building and additional equipment is $80,000.

Cutler-Hammer, Inc., Milwaukee, manufacturer of low voltage electrical control apparatus, has acquired all of common stock of Schweitzer & Conrad, Inc., Chicago, specializing in high voltage controls. Chicago company will retain identity and continue operations under own name, E. O. Schweitzer and N. J. Conrad continuing as directors and consulting engineers. B. L. Worden, president of Cutler-Hammer, Inc., becomes president of Schweitzer & Conrad, Inc.

Chicago

CHICAGO, July 7.—The past week, shortened by holidays, afforded no indication of the drift of machine-tool business in this territory. Total June sales are now available, and it is interesting to note that some dealers, whose books were bolstered by purchases for a new domestic refrigerator plant, found June a better month than May. Comparing June with the same month in 1928 shows business this year to be on a satisfactory basis. Sales in the first six months of 1930 are between 55 and 65 per cent of the volume in the first half of 1929, a peak year.

Fresh inquiry is spotty. Used machine tools in good condition and priced conservatively do not stand long on dealers' floors. Railroad buying is very quiet; new inquiry is limited to a drill press for the Chicago, Burlington & Quincy.

Federal Pipe & Supply Co., 900 South Campbell Avenue, Chicago, has awarded general contract to W. J. Lynch Co., 844 Rush Street, for two-story storage and distributing plant, 41 x 313 ft., with pipe cutting and threading, and other mechanical departments, to cost about $30,000 with equipment. G. E. Baumeister, Railway Exchange Building, is architect.

Wilson & Co., 4100 South Ashland Avenue, Chicago, meat packers, have filed plans for a three-story addition to cooler plant, 96 x 196 ft., including improvements in meat-packing division, to cost about $150,000 with equipment.

Northern Pacific Railway Co., Railway Building, St. Paul, Minn., has awarded general contract to Carl Steen, Grand Forks, N. D., for one-story addition to locomotive repair shops at Glendive, Mont., 100 x 100 ft., to cost about $85,000 with equipment.

National Stoker Co., Minneapolis, Minn. has taken over a plant and foundry at 3116 Snelling Avenue for manufacture of automatic stokers of underfeed ram type, including parts and assembling departments.

Commonwealth Edison Co., 72 West Adams Street, Chicago, is arranging for financing in amount of $12,000,000, a part of fund to be used for extensions and improvements in power plants and system.

Crane Co., 836 South Michigan Avenue, Chicago, has authorized plans for a two-story factory branch and distributing plant at Milwaukee, with pipe division, etc., to cost about $140,000 with equipment.

Iowa Steel & Iron Works, 400 Twelfth Avenue, Cedar Rapids, Iowa, has filed plans for two-story foundry and machine shop, 60 x 142 ft., to cost about $27,000, including equipment.

Big Horn Oil & Gas Co., Billings, Mont., has authorized construction of new oil refinery with adjoining storage and distributing division to cost close to $100,000 with machinery.

Hess Warming & Ventilating Co., 1207 South Western Avenue, Chicago, has asked bids on general contract for two-story addition to cost about $90,000 with machinery. W. H. Tomlinson, Morris Building, Joliet, Ill., is architect.

Pittsburgh

PITTSBURGH, July 7.—Business with local dealers was practically at a standstill last week because of the holiday. The prospect for heavy buying in the next two months is not good and, although inquiry for single tools is fair, the outlook for July and August promises little activity. Vacations will interfere with the placing of orders in many cases, but lack of ready funds on the part of buyers probably will be a more important factor.

Suspension of operations in metal-working plants for two weeks or longer is not likely to add to machine tool sales, notwithstanding that opportunities to make equipment replacements without loss of time are offered.

Westinghouse X-Ray Co., Inc., East Pittsburgh, has been organized as a subsidiary of Westinghouse Electric & Mfg. Co., same address, with capital of $2,000,000, to manufacture X-ray equipment and electrical precision apparatus. New company has secured an interest in Wappler Electric Co., Long Island City, and American X-Ray Corporation, 711 West Lake Street, Chicago, both manufacturers of products noted. A. E. Allen will be president of new Westinghouse unit, and Calvert Townley, vice-president.

St. Joseph Lead Co., 250 Park Avenue, New York, has begun construction of new plant on 150 acre tract, recently acquired near Monaca, Pa., for production of zinc metal, zinc oxide, and kindred products. A power house will be built. Entire project will cost over $2,000,000 with machinery. United Engineers & Constructors, Inc., 112 North Broad Street, Philadelphia, is engineer and contractor.

Lawrence V. Stevens, 265 Lebanon Avenue, Mount Lebanon, Pa., and associates have organized Fort Pitt Stoker Co., and plan operation of plant at Pittsburgh for manufacture of locomotive stokers and other fuel-burning equipment.

W. J. Rainey, Inc., Oliver Building, Pittsburgh, will carry out expansion at coal properties in Greene and Washington Counties, including installation of equipment for increased capacity, underground haulage system to connect its Clyde Nos. 1, 2 and 3 mines at Fredericktown, Besco and Clarksville, with power facilities, etc., to cost over $500,000.

Detroit

DETROIT, July 7.—Michigan Public Service Co., Ludington, has plans for new electric generating plant on Boardman River, near Traverse City, to cost over $400,000 with transmission system. General contract for power house has been let to Price Brothers Co., Lansing.

Grand Rapids Metalcraft Corporation, Grand Rapids, has engaged Austin Co., General Motors Building, Detroit, to prepare plans for new straight-line plant, totaling about 120,000 sq. ft. floor space, for concentration of production of Metalcraft company and its subsidiary interests, National Moulding Co. and Metalcraft Heater Corporation. Plant will cost $300,000, of which about $100,000 will be expended for machinery for manufacture of instrument boards, face plates, window moldings, door panels and other metal specialties for automobile bodies.

B. & L. High Compression Spark Plug Co., Detroit, has purchased six acres and group of buildings at Imlay City, and will remodel structures for new plant for high compression and high speed motor equipment. Charles Bell is president of company, which was organized recently; William Rogers is secretary and treasurer.

Donald A. Smith and John Preston, Flint, have organized Flint Stamping & Tool Co., with office at 5802 South Dort Highway, capitalized at $25,000, and plan operation of a local factory for production of metal stampings, tools, dies and kindred specialties, primarily for automotive service.

Motor-State Oil & Grease Co., Jackson, recently organized, has begun operations at a local plant for production of oils, greases, etc., for automobile and kindred service. W. E. Callaghan is president and general manager, and George H. Wilkins, secretary and treasurer.

Board of Education, Hamtramck, plans installation of manual training equipment in new two-story and basement junior high school to cost $300,000, for which

bids are being asked on general contract. B. C. Wetzel & Co., Dime Bank Building, Detroit, are architects.

Union Steel Products Co., Albion, has purchased plant and business of Roberts Portable Oven Co., Inc., 6525 South Laurel Avenue, Chicago, and will consolidate. Arrangements will be made at Albion plant to manufacture equipment heretofore produced by Roberts company, and equipment from Chicago plant will be removed to that location, with installation of other machinery for enlarged output.

Aviation Tool Co., Detroit, manufacturer of tools for aircraft, has arranged for change in company name to Aviation Parts Co., and will specialize as well in airplane parts.

Indiana

INDIANAPOLIS, July 7.—Indiana General Service Co., South Washington Street, Marion, operating electric light and power properties, has awarded general contract to G. W. Heinzmann & Son, 1740 West First Street, for one-story equipment storage and distributing plant, 60 x 160 ft., including repair department, to cost about $65,000. Company engineering department is in charge.

City Council, Richmond, is considering extensions and improvements in municipal electric light and power plant to cost $1,250,000, including installation of a new 15,000-kw. turbo-generator unit and auxiliary equipment. It is also proposed to provide equipment for standby service with a privately owned electric light and power company, to cost $115,000. R. S. Ashe is general manager and purchasing agent of property. H. Leland Lowe is engineer.

Coca-Cola Bottling Co., 265 Massachusetts Avenue, Indianapolis, plans installation of automatic bottling machinery, conveying and other mechanical equipment in new one-story plant, 100 x 150 ft., for which general contract has been let to W. P. Jungclaus, 825 Massachusetts Avenue, to cost about $70,000 with equipment.

Ferguson Coal Co., Terre Haute, plans expansion and improvements at Crown Hill coal properties, including rebuilding and enlargement of steel tipple, conveying and mechanical-handling equipment, coal-cleaning and other preparing machinery, to cost over $60,000.

Warner Gear Co., Muncie, subsidiary of Borg-Warner Corporation, has acquired a 75-acre tract near city and has begun construction of a new plant to cost about $2,000,000 with equipment.

Gulf States

BIRMINGHAM, July 7.—Houston Oil Co., Houston, Tex., has approved plans for a storage and distributing plant at Corpus Christi, Tex., to be connected by pipe lines with producing properties in Bee, Webb and Refugio Counties, totaling more than 100 miles, entire project to cost over $600,000, with compressor stations and other equipment. Company has recently arranged for increase in capital from $35,000,000 to $37,000,000, part of fund to be used for expansion.

Great West Refining Co., Big Spring, Tex., is planning early construction of gasoline refinery about three miles from city, to cost over $100,000 with equipment.

Union Oil Mill, Inc., West Monroe, La., manufacturer of cottonseed oil, has awarded contracts to J. L. Humble Construction Co., West Monroe, and Muskogee Iron Works, Muskogee, Okla., for two-story addition, 90 x 220 ft., to cost about $55,000 with equipment.

City Council, Shreveport, La., has rejected bids recently received for hangars and other buildings for airport, to cost about $100,000 with equipment, and will ask new bids soon.

City Ready-Cut House Co., 2509 Campbell Street, Houston, Tex., is planning for expansion, including new building and equipment, to cost about $70,000. Company has recently arranged for increase in capital from $80,000 to $200,000.

Phillips Pipe Line Co., Bartlesville, Okla., a subsidiary of Phillips Petroleum Co., same address, has engaged, Ford, Bacon & Davis, Inc., 39 Broadway, New York, engineer, to design and supervise construction of new gasoline pipe line from Borger, Tex., to Wichita, Kansas City and St. Louis, with storage and distributing plants, pumping stations and other structures, to cost over $10,000,000. Line is scheduled for completion early in 1931.

Wedell-Williams Air Service, Inc., New Orleans, La., has awarded general contract to Arch Construction Co. of Louisiana, Inc., for hangar unit at airport in Jefferson Parish, 100 x 100 ft., and 20-ft. lean-to extension, with repair and reconditioning facilities, to cost over $75,000 with equipment.

R-K-M Co., Houston, Tex., manufacturer of oilfield machinery and equipment, etc., has arranged for increase in capital totaling about $400,000, bulk of proceeds to be used for plant extensions and improvements.

East Baton Rouge Police Jury, East Baton Rouge, La., is asking bids until July 21 for two-story hangar, 100 x 120 ft., repair shop, and other buildings for municipal airport. Jones, Roessle & Olschner, Maison Blanche Building, New Orleans, are architects.

United Gas Co., 1601 Commerce Street, Houston, Tex., operating natural gas properties, a subsidiary of Electric Bond & Share Co., New York, has secured a controlling interest in Northern Texas Utilities Co., operating similar properties at Wichita Falls, Tex., and vicinity, with gas rights in Amarillo field. Purchasing company plans expansion program, including additional pipe lines with compressor stations and accessory equipment.

Pacific Coast

SAN FRANCISCO, July 3.—Plomb Tool Mfg. Co., 2209 Santa Fe Avenue, Los Angeles, manufacturer of hand-forged tools, has awarded general contract to Consolidated Steel Corporation, 1200 North Main Street, for one-story addition, 80 x 80 ft., to cost about $20,000. Hamm, Grant & Bruner, Inc., Ferguson Building, is architect and engineer.

Apple Growers Cold Storage Co., Watsonville, Cal., will take bids on general contract for one-story addition to cold storage and refrigerating plant, 75 x 100 ft., to cost about $75,000 with equipment.

California Chemical Corporation, 111 Sutter Street, San Francisco, manufacturer of potassium sulphate, lime and other heavy industrial chemicals, is planning expansion and betterments at plant at Newark, Cal., to cost about $1,000,000 with conveying, loading and other mechanical-handling equipment for raw material. This will be beginning of a development program at plant to cost more than $3,500,000.

Cyclops Iron Works, 837 Folsom Street, San Francisco, has awarded contract to California Steel Co., Hobart Building, for one-story plant unit, including pipe department, to cost about $30,000 with equipment. H. C. Vensano, 58 Sutter Street, is engineer and construction manager.

Board of Education, Pomona, Cal., has awarded general contract to W. O. Moomaw, La Verne, Cal., for one-story vocational training shop at Freemont School, 51 x 107 ft., to cost about $35,000 with equipment. T. C. Kistner & Co., Architects' Building, Los Angeles, are architects.

Officials of Shell Oil Co., Shell Oil Building, San Francisco, have organized Shell Chemical Co., a subsidiary, to construct and operate a nitrogen fixation plant for production of ammonia, fertilizers and other nitrogen products. About 600 acres has been acquired at Nichols, near Pittsburg, Cal., and plans for units of one and multi-story type will be placed under way at once, to cost close to $4,000,000 with machinery. Project will include a power house and machine shop.

Northwest Paper Co., Cloquet, Minn., contemplates a wood pulp plant for conversion service at Longview, Wash., to cost over $150,000 with machinery. Company will carry out project in connection with general expansion program in progress at main Cloquet mill, to cost about $1,500,000. Jacobson Engineering Co., Plymouth Building, Minneapolis, Minn., is company engineer. H. C. Hornby is president.

Charles K. Spalding Logging Co., Salem, Ore., is planning two-story mill, 106 x 140 ft., at Klamath Falls, Ore., to manufacture sash, doors and other millwork products, to cost over $80,000 with machinery. H. R. Perrin, Klamath Falls, is company architect. O. A. Macy will be manager at new mill.

Applications for licenses for construction of hydroelectric power plants on Long, Crater and Dorothy Lakes, near Juneau, Alaska, by Crown-Zellerbach Corporation, 343 Sansome Street, San Francisco, operating paper mills, and George T. Cameron, head of *San Francisco Chronicle*, represent two individual power and paper mill projects, and not one enterprise. One development will cost over $3,500,000, and other more than $5,000,000 in order noted.

Canada

TORONTO, July 7.—Construction is underway on a machine shop addition, one story, 50 x 120 ft., to cost $30,000, for J. & J. Taylor, Ltd., 133 Front Street, East, Toronto. John G. Kent & Son, Ltd., 1221 Bay Street, is general contractor; Harkness & Hertzberg, 705 Confederation Life Building, Toronto, are consulting engineers.

New plant at East Windsor, Ont., for Canadian Bridge Co., Walkerville, Ont., is nearing completion and will be ready for installation of equipment within six weeks. Plumbing and heating contracts have not yet been let. Plant will represent an expenditure of $100,000. George D. Davies is engineer in charge of work.

Following announcement that controlling interest in Eugene F. Phillips Electrical Works, Ltd., Brockville, Ont., has been acquired by United States and British interests, it is stated that additions and improvements will be made at Brockville plant to cost about $750,000.

Bids are being received by F. C. T. O'Hara, deputy minister of Department of Trade and Commerce, Ottawa, for construction of foundation work, etc., for erection of a 1,000,000 bu. grain elevator at Lethbridge, Alberta, to cost $800,000. C. D. Howe & Co., Port Arthur, Ont., are engineers.

Norton Co. of Canada, Ltd., Hamilton, Ont., has awarded general contract to W. H. Cooper, 36 James Street, North, for a two-story addition, 40 x 50 ft., to cost $12,000.

Robertson Lead Mfg. Co., Ltd., 6744 Hutchison Street, Montreal, has awarded contract to W. H. Madigan, 209 Clifton Avenue, for new one-story plant, 80 x 270 ft., to cost $50,000.

Foreign

OFFICIALS of Austin Motor Co. of England, Ltd., London, manufacturer of automobiles, have organized Canadian Austin Car Co., Ltd., to operate in Canada. New company has purchased property at Toronto for assembling plant, to be followed later by departments for parts manufacture. E. P. Clarkson, formerly managing director for Canadian Dodge Co., Toronto, will head organization and will be active in plant operations. New company will be closely identified with American Austin Car Co., Inc., Butler, Pa., a subsidiary of same parent organization.

Siemens & Halske, Ltd., Frankfort-on-Main, Germany, manufacturer of electrical machinery and equipment, has organized a Tschekische Elektrotechnag fuer Schwachstromtechnik (Techech Electro-Technical Corporation), with capital of 16,000,000 Czechoslovakian crowns (about $480,000), to establish a plant near Prague, Czechoslovakia, for manufacture of telephone equipment, parts, etc.

Copenhagen Gas Co., Copenhagen, Denmark, is planning expansion and improvements, including installation of vertical retorts and other equipment, to cost about 6,200,000 crowns (about $1,674,000). Information at office of Bureau of Foreign and Domestic Commerce, reference Denmark No. 109122.

Mexican Light & Power Co., Mexico City, Mexico, has authorized an increase in capital, majority of proceeds to be used for expansion and improvements in power plants and system, including purchase of electric light and power station and system at Toluca. It is understood that gross financing of company for expansion will approximate $5,000,000.

Procter & Gamble Co., Gwynne Building, Cincinnati, manufacturer of acids, oils, soaps, etc., is planning expansion in Europe, including purchase of one or more existing plants in France and Germany, and development of properties to manufacture company products. It is understood that company will acquire Cadum Soap Co., Paris, France. R. R. Deupree, vice-president, and Harvey C. Knowles, general production superintendent, are now abroad to complete details.

New Trade Publications

Testing Machines.—Herman A. Holz, New York. Abridged catalog 31-E of Alfred J. Amsler & Co., the Swiss manufacturers of testing machines operated by the hydraulic principle.

Portable Drill.—Guibert Steel Co., Box 1037, Pittsburgh. Booklet of 16 pages, illustrating and describing "Toggle Bug," which is said to drill holes through rolled steel, cast steel, cast iron, wood and similar materials. Dimensions are given in the booklet. Numerous pictures show the machine at work in varying applications.

Pyrometers.—Illinois Testing Laboratories, Inc., Chicago. Bulletin No. 528 of four pages, illustrated, describes a new type of immersion pyrometer for non-ferrous metals, recently developed by this organization.

Storage Batteries.—Edison Storage Battery Co., Orange, N. J. Booklet of 11 pages, dealing with storage battery transportation—a monthly publication devoted to topics of current interest. This booklet goes into the early history of the storage battery, and Mr. Edison's experiments and developments up to the present.

Silicates.—Philadelphia Quartz Co., Philadelphia. A two-page illustrated leaflet, entitled "Silicate P's and Q's," describes one of the silicates of soda produced by this company. The particular product discussed is sodium metasilicate which has certain uses in industry.

Pickling Baskets.—Weaver Brothers Co., Adrian, Mich. A four-page illustrated folder describes strong, tough, acid-resisting baskets and crates made of rolled monel nickel.

Manufacturing Industries in 1927

Analysis of the 1927 census of manufactures, made by the National Industrial Conference Board, shows that the rubber industries have a larger number of employees and a larger amount of power installed, in the *average* establishment, than any other. Iron and steel plants come fourth in number of employees per establishment and second in amount of power.

They stand first in extent of horsepower per worker, with 9.96 compared with 8.49 for the chemical industries, which are second in rank. Metals and metal products have 4.51 hp.; machinery, 3.39 hp.; transportation equipment, including automobiles, 4.10 hp., for each employee. The average of all was 4.65 hp.

Average annual cost of labor for each wage earner was highest in the transportation equipment plants, at $1,623. Iron and steel plants stood in fourth position, with $1,513, while all industries averaged $1,299.

Total wage earners in the iron and steel industry, including products made of iron and steel, but not machinery, was given as 835,501, or almost precisely 10 per cent of the total (8,353,977) for all groups of manufacturing industries. Primary horsepower in the iron and steel industry was given as 8,323,039, or about 21½ per cent of the total (38,825,681) for all groups, thus showing somewhat more than twice as much power to the employee as in the average plant.

Wages in the iron and steel group totaled $1,264 millions, or about 11.5 per cent of the total. This shows an average wage some 15 per cent higher than that for other industries, taken as an aggregate.

In the five metal-working groups there were 2,916,050 wage earners, who were paid wages totaling $4,385 millions, or an average of $1,504 per person. All other manufacturing wage earners numbered 5,437,927. Their wages of $6,464 millions made an average of $1,189 for each person.

Coal Supplies for 26 Days

Bituminous coal held by industries in the United States is estimated by the National Association of Purchasing Agents as of June 1 to have been sufficient for 26 days' use at current rate of consumption. By-product coke plants had enough for 21 days; electric utilities, for 49 days; coal gas plants, for 43 days; railroads, for 20 days; steel mills, for 33 days; and other industries, for 27 days.

Total stocks amounted to 29,824,000 net tons. Consumption during May was given as 34,685,000 tons. Stocks were the lowest in more than a year and the May consumption was the lowest for any month since June, 1929, and exceeded that month by only 0.6 per cent.

Disston saws which accompanied Admiral Byrd in his flight over the South Pole were returned to Philadelphia on July 1 by Victor H. Czegka, chief welder of the Byrd expedition. S. Horace Disston, vice-president of Henry Disston & Sons, Inc., says the saws would be added to the Disston collection, which contains a hand saw that made the first flight across the ocean on the Graf Zeppelin.

United States Imports of Pig Iron by Countries of Shipment

(*In Gross Tons*)

	May		Five Months Ended May	
	1930	1929	1930	1929
United Kingdom	2,109	6,342	6,998	23,832
British India	7,809	4,314	40,631	21,536
Germany	....	50	50	103
Netherlands	3,028	2,916	5,151	13,874
Canada	32	36	338	422
France	....	....	....	....
Belgium	....	....	....	184
Norway	783	228	2,063	876
Sweden	130	200	964	803
All others	....	307	41	435
Total	13,891	14,393	56,236	62,065

From Department of Commerce.